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Teaching Heat Treating

How the University of Illinois Covers the Subject and What Equipment It Uses

BY E. T. LANHAM*

MOST steels, whether carbon or alloy, require some specific heat treatment to produce the best results. Few, if any, steels will perform satisfactorily in their natural state; just as the addition of different chemical elements may intensify one set of products, so heat treatment may be varied to produce different results in the same steel.

The engineer, in the application of heat treatment, should have a thorough knowledge of the composition of the steel and the effects of different alloys on those steels, as by combining the proper chemical elements with intelligent heat treatment, there results a steel with the highest chemical and physical qualities. Again, the treating of steel consists of heating and quenching, normalizing, annealing and tempering, any one of which will produce certain changes, either desirable or undesirable, in the steel. For this reason, if for no other, it is quite obvious that a knowledge of the influence of the chemical composition combined with the proper heat treatment is necessary to the designing or construction engineer.

Some of the larger industries maintain a training course in their own particular field, in which the graduate engineer spends a year, or more, acquiring the practical training and knowledge that he should have received during his four years of technical training. With this end in view, the University of Illinois has added to the curriculum for engineers a practical course in the heat treatment of steels, given both semesters for students of senior standing in mechanical engineering.

It would be impossible to impart a knowledge of the subject in the time allotted without exercising great care in choosing the proper equipment and installing it to present a model laboratory.

The furnace equipment comprises gas and electric furnaces. Each line consists of a complete heat-treating unit—one high temperature furnace, 2500 deg. Fahr., two furnaces for temperatures up to 1800 deg., and one drawing or tempering bath, controlled from 400 to 1000 deg. Furnaces and pyrometers are arranged so that every furnace in the room, 18 of them, may be in operation at the same time and correct temperatures read from the indicators.

In addition to the heating and cooling equipment, there is a complete laboratory for microscopic investigation consisting of grinding wheels, carborundum belts and disks for finishing specimens for microscopic inspection; an etching table, microscopes, hardness testing machines, and a tensile testing machine complete one part of the labor-

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atory. In a separate room, away from heat and dust, will be found the recording and controlling pyrometers. An outline of the course is given in an accompanying tabulation.

The aim of the course is to so familiarize the student with the methods of treating and examining steels that he will have at least the foundation from which to work.

Industries are concerned primarily with results. If a gear should fail the question is not who made it, but rather why did it fail? There are several ways of determining the answer.

First, does the steel from which the part was made conform to the specifications, as to the carbon content? Our students are taught to judge by a sample, prepared by themselves and examined under the microscope, approximately the per cent carbon in the steel.

Second, was the part properly heat treated before machining? The microscope, if again applied to the sample, examining the piece for different structures, may disclose improper normalizing or annealing, and the difficulty may be removed by proper heat treatment.

In the study of alloy steels, test pieces of smaller diameter are often used to demonstrate the fact that these steels are much stronger than plain carbon steels, and may have a higher tensile strength, though of smaller section, than plain carbon steels. Another point to be taken into consideration is the fact that different elements have different effects on the critical temperatures and on the resistance to abrasion, shock and corrosion.

Alloy tool steels, particularly the high-tungsten steels, are subjected to various heat treatments—annealing, hardening and tempering—in order to bring out the best qualities and produce an efficient cutting tool.

In the machining of steel castings or forgings, very often the mechanic is confronted with difficulties over which he has no control. The machine tool refuses to remove stock at the required speed or becomes dull, requiring too much grinding. If drilling, he finds the drill will not perform as it should. An examination of the structure will reveal a network of cementite, the hardest structure in steel, and also suggests to the student the necessity of proper normalizing and annealing and he learns that if he will heat the steel to 1800 deg. Fahr. and quench, this so-called cementite is broken up and all that remains to be done is to anneal at a lower temperature, 1400 to 1450 deg., and allow it to cool in the furnace, which prepares the steel for machining without difficulty. In all of the problems the student is taught to identify the microstructures and to determine the condition of the steel by those structures.

One of the most important operations in the heat treatment of lower carbon steels to enable them to resist wear and absorb shock is the process of carburizing and case-hardening. Why should motion parts of engines be carburized? Why use an alloy steel with a low-carbon content? Why, after carburizing, is it desirable to give the parts a double heat treatment, and when is the double treatment unnecessary? In this connection, studies are

Outline of Course in Heat Treating

1.—A study of manufacturing processes and the composition and constitution of iron and steel.

2.—A study of pyrometry and the calibration of thermocouples against a standard couple.

3.—Tensile and hardness testing of plain carbon steels heated to different temperatures and quenched in various quenching baths.

4.—A study of critical temperatures and how to obtain them in different steels.

5.—Grain structures, macroscopically and microscopically.

6.—Annealing, normalizing and hardening of steel.

7.—Tempering of steel.

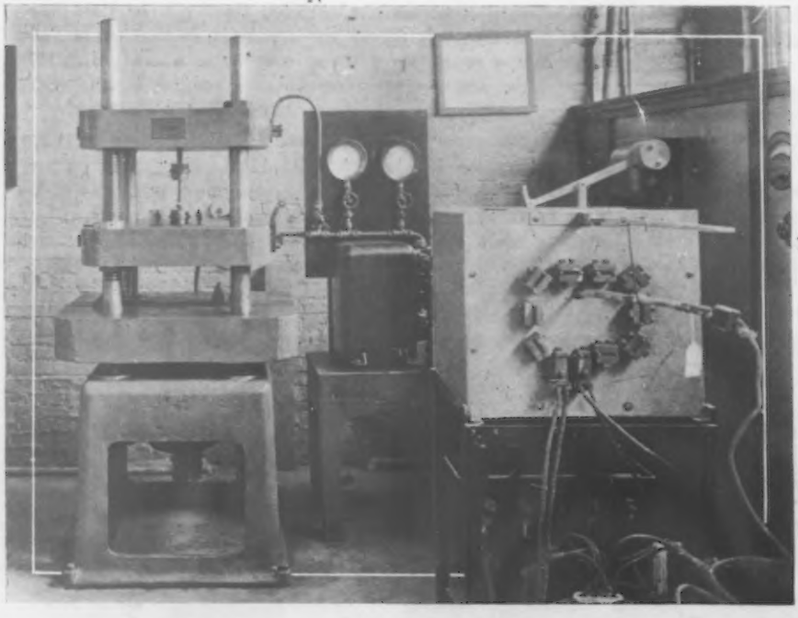
8.—Carburizing and case hardening.

9.—Effects of elements on the properties of steel.

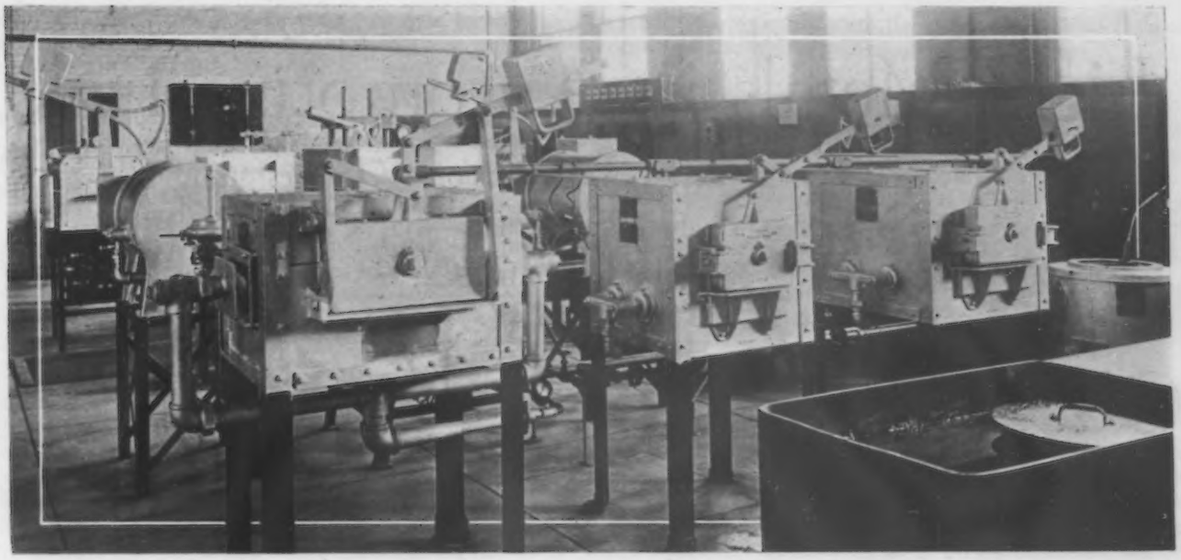
10.—A study of structural alloy steels.

11.—Alloy tool steels.

12.—Microscopic study of all steels before and after treatment.



A HYDRAULIC Testing Machine Is Part of the Equipment. Specimens shown held in grips



There Are 18 Furnaces, Gas and Electric, in This Room. High-pressure gas furnace and quenching tank in foreground and electric furnace in background

made of different carburizing materials, temperatures, length of time to be held at temperature, methods of quenching to prevent warpage and the process of carburizing for colors.

In order to aid the student in his laboratory experiments and conserve his time, the instructor in charge has prepared a laboratory manual which has been in use for three years, during which it has been revised and enlarged.

Metal for Brass Pickling Containers

ADDRESSING the American Society of Mechanical Engineers in Buffalo, Feb. 25, P. D. Schenck, president Duriron Co., Dayton, Ohio, made a plea for more thorough testing of corrosion resisting metals under actual service conditions. If expensive installations are made on routine laboratory tests and with scanty background of experience, expensive failures are almost certain to occur. He cited several concrete examples to illustrate his main thesis, among them the following:

"For several years we have been furnishing various pieces of equipment to a large parchment paper company. Parchmenting is done by running a special grade of paper through strong sulphuric acid baths and thoroughly washing it. The composition of the bath was given us as 'sulphuric acid with sodium sulphite and some other impurities.' We furnished samples of various bronzes and steels which we absolutely know would be practically unaffected by this particular corrosive solution. The samples were tested by the paper company and invariably reported as not standing up.

"To make a long story short, someone happened to mention, during a visit of one of our men in the plant, the difficulty they were having with the rapid solution of copper conveyor chains in the solution. This remark cleared up the whole problem, as while the samples we were sending down were suitable for sulphuric acid, they were not suitable for copper sulphate, which was, of course, present, due to the very rapid dissolving of the copper chains. High-silicon iron, which we have developed under the trade name of Duriron, is the only material which will stand the combination of the free sulphuric acid and weak copper sulphate. The installation of Duriron squeeze rolls, which are alternately exposed to the effect of the acid and air, solved the problem.

"If the copper sulphate content were appreciably higher in the solution, the 18-8 chromium-nickel alloys would do the work, but they will not stand the high percentage of free sulphuric acid.

"An example of these conditions is a case of tanks for pickling brass and bronze. The high nickel-chromium alloys successfully withstand the sulphuric acid pickling bath, but they are very rapidly soluble in the presence of copper sulphate. On the other hand, the high chromium-nickel alloys will stand copper sulphate, but not sulphuric acid. This problem has been solved successfully so far by instructing the operators not to replace the free sulphuric acid, but leave an appreciable percentage of copper sulphate which acts as an inhibitor to the corrosive action."

Paint Coatings and Strength of Riveted Joints

IN 1927 the German railroads prescribed that all iron parts used in the construction of railroad cars should be coated with white lead oil paint at the joints before assembly. In 1928, the railroads gave instructions that immediately after the removal of the rust all iron parts were to be carefully painted with red lead, and shortly before assembly all joints were to receive a second coat of red lead.

H. Egan, in an article in Krupp's *Monatshefte*, Vol. 10, 1929, describes tests he has made on riveted joints treated as above and also in the unpainted condition, and he records the results of his measurements of the amount of slip at the joint when under tension. It is shown that the presence of the paint between the parts has an adverse effect, but the four coats of red lead paint in the joint according to the later prescription does not produce worse results than the two coats of white lead oil paint of the earlier prescription. The breaking stress was not affected by the coats of paint.

Light Metals in Automotive Field

New Alloy with Very Low Expansion—Car Designing Now on a Performance Basis—Facts About an All-Aluminum Car

BY DR. ZAY JEFFRIES*

ONE approaches the subject of automotive materials with considerable uncertainty because what is an automotive material today may not be tomorrow. Aluminum and magnesium, principally because of their low specific gravities, are being adopted as standard for aircraft construction wherever their other properties will permit. While cost is one consideration, a small saving in weight compensates for a large cost differential. The aircraft industry is passing through the stage in which the cost of raw materials is small as compared with the total cost of construction. This condition will change in the future in such direction that the cost of materials will be a more important factor, but it seems probable that the trend will be toward a greater percentage of light metals.

Aluminum is being generously employed in outboard motors, principally because of the desire to combine portability and relatively high power. Also in Diesel engines some aluminum is used to reduce the total weight and some is used in pistons because of the combination of lightness and high heat conductivity, permitting the employment of higher speeds and greater power output than is possible with iron pistons in an equivalent engine size. The same is true of the large spark ignition internal combustion engines—for example, those used in gas-electric rail cars and for marine purposes.

Aluminum in Trucks and Buses

IT might be expected that the choice of materials for truck and bus construction would be more influenced by economics than for pleasure cars. Trucks and buses are usually run by the original purchaser to substantial destruction and many users have opportunity and incentive to ascertain accurately the operation cost. Furthermore, there is not the possibility for competition in style and in general the purchaser of a truck or bus is less apt to be influenced by esthetic and psychological factors. A factor which must be considered for the largest units is weight restriction on highways and bridges. Aluminum might be used for weight reduction in such cases, regardless of the transportation economics.

It is a fact that truck and bus manufacturers, especially those making heavy and high-speed vehicles, are endeavoring to use aluminum both in the chassis and body. It is interesting to note that the service conditions in trucks and buses are so severe that the only aluminum that can be used for some parts is the heat-treated material of comparatively recent development. The experimental work now in process in the field promises some interesting results in the near future. A number of the points discussed below apply to trucks and buses as well as to pleasure cars.

In considering the use of aluminum in automobiles, it may be of interest to recall some of the earlier practices. Before the days of real mass production of automobiles, the cost of fabricating was so high that the cost of raw and semi-finished materials was a small part of the total. It made little difference in final cost whether a crankcase was aluminum or cast iron. The plant was usually behind on production and aluminum cases could be machined faster than iron and more finished cars could be produced with a given plant investment. The engines were usually slow speed and excess weight had to be fought in order to obtain performance, so the aluminum case was welcome to the engineer. Thus came aluminum crankcases and for the same reason aluminum oil pans, aluminum gear cases, and a number of other parts.

With increased production came the urge for decreased cost and the stamped steel oil pan replaced to a large extent the aluminum oil pan. The old-time conventional engine had four main parts from bottom to top, namely, oil pan, crankcase, cylinder block and cylinder head. Another major economy resulted when the crankcase and cylinder block were cast in one piece. It was necessary for the cylinder bores to be cast iron and consequently the aluminum crankcase largely gave way to cast iron.

Aluminum in Body Construction

In body construction aluminum was used both in sheet and cast forms. The light weight was helpful in keeping the center of gravity low. Dies for forming body sections from sheet are very expensive and many of the old-time models were not made in sufficient numbers to warrant the die cost. For hand forming, aluminum was superior to steel and equal stiffness could be attained with half the weight of steel. Consequently aluminum was used to a considerable extent in automobile bodies. Mass production led to the almost universal use of large presses and dies for forming body sections. Also the steel manufacturers made improvements in quality for deep drawing and steel was largely adopted for bodies.

Of course while all of these changes were in process, many experiments were made with the object of utilizing aluminum in every possible way in the automobile. The aluminum piston thus came into use, but this subject will be discussed more in detail later. Two automobile manufacturers in America put aluminum engines in their cars. There developed differences of opinion among automotive engineers as to the fitness of aluminum, regardless of cost, for many automobile parts.

In 1919 the Aluminum Co. of America undertook to answer some of these questions and engaged Lawrence H. Pomeroy to design a car in which aluminum would be used for every part where it would function as well or better than other materials. The work continued for seven years, during which time four-cylinder and six-cylinder test cars were made and later a number of the six-cylinder cars were made, one of which was tested by running more than 100,000 miles.

An All-Aluminum Car

SOME high spots of this investigation may be of interest. In the first place, it is possible to use effectively only about $250 worth of aluminum in a 133-in. wheelbase

*Consulting metallurgist, Cleveland. The article is part of a paper, "Light Metals in the Automotive Industry," presented at first regional meeting of the American Society for Testing Materials, in Detroit, March 19.

car. The use of this amount of aluminum will reduce the weight of the iron and steel chassis from about 2800 lb. to 1800 lb. Non-metallic parts like tires and battery solution cannot be replaced by any metal. There are certain parts like crank and camshafts, springs, gears, bolts and so forth, for which steel is clearly superior to aluminum. Standard starters and generators were used and these consisted mostly of steel and copper.

The principal aluminum parts were pistons, connecting rods, cylinder heads, cylinder block, crankcase, oil pan, wheels, brakeshoes, frame, front axle, rear axle housing, differential carrier, torque, tube, gearcase, steering column, gasoline tank, radiator shell, and brake drums. In addition, a large number of small parts were made of aluminum. The body was made of cast aluminum and weighed about the same as a standard pressed steel body, but it was materially more rigid.

From the automotive engineer's standpoint, the performance results were about as anticipated from the power-weight ratio. The advantage gained in power-weight ratio can be used at the designer's discretion to obtain the desired combination of performance and fuel economy. The weight saving is not only that resulting directly from the substitution of aluminum for heavier metals, but there is an indirect saving in weight as the result of the use of lighter tires, springs and other parts. Furthermore, the generous use of aluminum may make possible the substitution for parts otherwise dangerously close to the upper stress limits. For example, an aluminum differential carrier might be overstressed in a steel and iron car weighing 4000 lb. but might be usable in an aluminum car of the same size weighing 2700 lb.

Of course, the use of so much aluminum involves a number of problems. It is not possible with all parts merely to substitute a piece of aluminum of about equal stiffness and weighing about one-half that of the iron or steel part. Engineering thought must be exercised in the selection of alloy, decision as to where forgings, stamped parts, permanent mold, sand and die castings can best be utilized, and in the changes of design and methods of fabrication to accommodate aluminum. The best application of aluminum will come only after its extensive use.

Problem of Coefficient of Expansion

One of the problems of major importance arising from the use of ferrous metals and aluminum in combination is caused by differences in coefficient of expansion. While this is particularly true in the engine where relatively high temperatures are encountered, the problem obtains in other parts as well. The high expansion of aluminum as compared with ferrous metal may be advantageous for aluminum brakeshoes. It is usually, however, the opposite and requires careful consideration. If an aluminum cylinder head is attached to a cast iron cylinder block, for example, the differences in expansion may result in strains which tend to permanently warp the aluminum, making frequent gasket adjustments necessary to avoid leakage.

The Aluminum Piston

Again in the connecting rod large end bearing, if the clearance is too small there is danger of seizure when the engine stands in very cold weather and if the clearance is too large the bearing may be noisy when the motor is hot. These difficulties can be overcome by sufficient attention to detail, but they are mentioned to indicate the need for careful engineering in the application of aluminum.

Perhaps the part which has given the greatest difficulty and on which most engineering effort has been expended is the piston. The advantages of high heat conductivity and lightness have been so great that the difficulties arising from the difference in coefficient of expansion between the aluminum piston and the cast iron cylinder have in some cases been endured and in others various expedients to minimize the troubles have been used.

Some of the difficulties experienced in the past have been caused by poor lubrication, improper machining, lack of care in fitting and adoption of aluminum pistons for motors ill-adapted for their use, but by far the greatest real problem has been expansion. If a trunk type aluminum piston is fitted with too little clearance in a cast iron bore there is danger of seizure when the motor is hot and if the clearance is too generous there may be piston slap when the motor is cold.

The principal methods of minimizing this difficulty have so far been by special design of the piston itself. The so-called "split skirt" and the "invar strut" designs have been most successful.[1] The "split skirt" is all aluminum and close fitting is made possible by slotting the skirt in such a manner as to make it a spring. In the "invar strut" design, inserts of iron-nickel alloy of low expansion are cast in the piston on two sides adjacent to either boss. Suitable slotting permits the low expansion insert to compensate for the higher expansion aluminum in the skirt.

Although aluminum pistons are used practically to the exclusion of all others in Europe, a rough estimate indicates that only about 70 per cent of the cars being currently produced in the United States are equipped with them. Aluminum pistons cost more than cast iron pistons, but when the fact is taken into consideration that, by using aluminum, a higher compression ratio can be employed and about 5 per cent additional power secured, the higher price is more than justified on this basis alone. It seems apparent that there is still some trouble with even the present close-fitting aluminum pistons.

New Alloy Developed

A RECENT aluminum alloy development in this field may have far-reaching effects. There has been developed

[1] "Light Alloy Pistons," by G. D. Welty—S.A.E. *Journal*, August, 1927, page 146.

Important Points in Dr. Jeffries' Paper

IT is possible to use effectively only about $250 worth of aluminum in a 133-in. wheelbase car. This means a reduction in weight of the iron and steel chassis from 2800 lb. to 1800 lb.

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NEW aluminum alloy has a coefficient of expansion of 0.0000105 per degree Fahr. between 70 and 212 deg. Fahr.

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ALUMINUM pistons used almost entirely in Europe—only in about 70 per cent of cars made in America.

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AUTOMOBILES are designed today pretty much around performance. Low cost is always an important factor but money is being spent to gain operating satisfaction.

by the Aluminum Co. of America an alloy, No. 132, having a coefficient of expansion of 0.0000105 per degree Fahr. between 70 and 212 deg. Fahr., or 20 per cent less than that of pure aluminum and 15 per cent less than the present piston alloys containing about 10 per cent copper. The clearance used in fitting pistons is not merely a matter of the coefficient of expansion of the piston alloy but depends also on the coefficient of expansion of the cylinder and the heat conductivity of the piston. No. 132 alloy can be fitted with 20 per cent less clearance than the ordinary aluminum alloy in a cast iron cylinder. Engineers seem to be agreed that the trunk type piston, with its large bearing surface, freedom from distortion and collapse, has real advantages.

Aluminum company engineers have recently worked out a design of motor which preserves the advantages of the trunk type piston and permits the use of aluminum with its advantages. No. 132 alloy has about the same expansion as the so-called austenitic or non-magnetic irons and steels. One of these irons is the "Niresist" cast iron on which the International Nickel Co. has been working. It contains about 20 per cent Monel metal, with some chromium and manganese, can be cast like cast iron and has a coefficient of expansion of about 0.0000095 per degree Fahr. between 70 and 212 deg. Fahr. Also the austenitic stainless steels of the Nirosta type and Hadfield's manganese steel have the proper thermal expansion for use with No. 132 alloy.

In applying this combination, the high expansion cylinder must be allowed to expand freely when heated and to accomplish this a high expansion cylinder block is helpful. Such a block works better with an aluminum cylinder head than does cast iron. This points practically to an aluminum motor with a high expansion iron alloy for the cylinder sleeve. The question might properly be asked—why use an aluminum motor just to permit the use of aluminum trunk type pistons? In view of the present status of the use of aluminum in American automobiles, this would represent a revolution. However, it is a matter which is now receiving much attention.

Automobiles Designed Now on Performance

Automobiles are designed today pretty much around performance. Low cost is always an important factor, but money is being spent to gain performance. The generous use of aluminum is capable of reducing the weight of most water-cooled American cars about 20 per cent. About 10 to 12 per cent saving in weight can be readily effected without reduction of power. Such weight saving improves the performance. The use of the aluminum engine would not only reduce weight and improve the functioning of the piston, but the cylinder block could be cast for insertion of "wet liners" which would make for economy of construction and desirable servicing. The crankcase-cylinder-block casting would be much simpler to cast with provision for insertion of wet cylinder sleeves than in present practice of casting the cylinder barrels integral with the crankcase and block.

Aluminum Used to Greater Extent in Europe

Although aluminum is used to a much greater extent per automobile in Europe than in America, comparisons should not be hastily drawn. The conditions are different. The cost of fuel is higher in Europe. The taxes are generally high, and higher the greater the horsepower. In some countries there is also a road tax which is higher the greater the weight of the vehicle. All of these factors favor the use of aluminum, and in Germany even magnesium is used to a considerable extent to combat weight. Again, the mass production forces in Europe have not been so active as in America and a change toward more iron and steel may be witnessed there in the future. Opposed to this trend are the factors mentioned above and the fact that there is ample production capacity in Europe and keen competition in sales.

Suggest New Phase in Automobile History

May it not be, however, that America is entering a new phase of automobile history? We have a great excess of manufacturing capacity. Competition in quality and performance is quite as keen as price competition. It can now be definitely stated that any performance which can be attained in an iron and steel car can be substantially improved by using aluminum. To aluminumize a medium sized car as completely as is feasible would apparently cost, ultimately, taking into consideration the various economies and higher scrap value, about $100 more than the present cars. By the time the car reached the consumer the added amount would, of course, be increased.

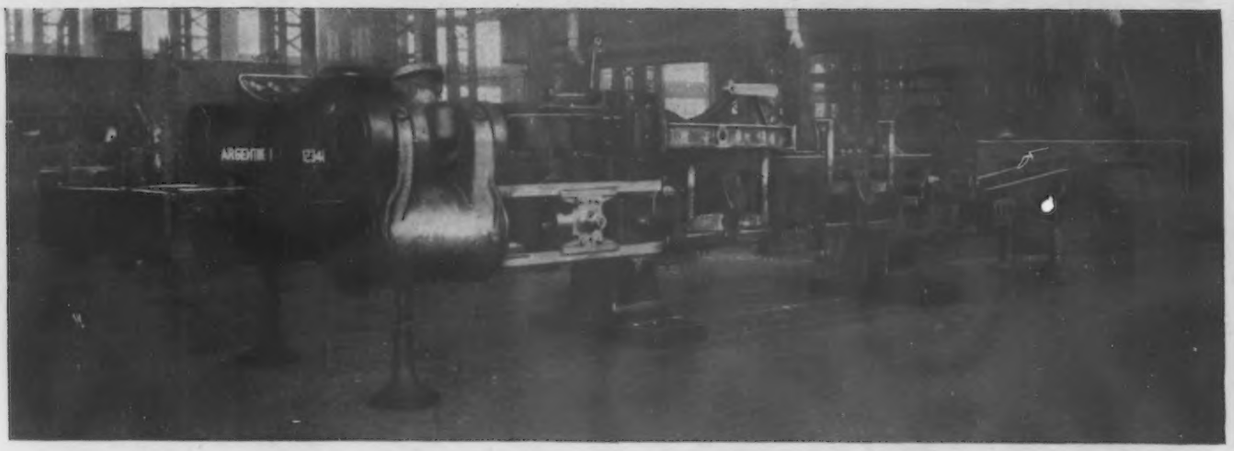
The developments in strong heat-treated alloys for both cast and wrought products, the more common use of strong aluminum forgings, the development of structural shape rolling of strong alloys and the advent of magnesium as an engineering material provide an outlook for the future more fraught with potentiality for use of light metals than at any time in the history of the automotive industry.

How to Secure Best Conditions for Pouring Steel Ingots

IN the casting of large ingots by top pouring, the ideal temperature conditions would be that, at the commencement of pouring, the stream of metal from the ladle should be very hot to counteract the cooling effect of the air and the chilling effect of the mold bottom. After the first few inches rise in the mold, it is desirable that the stream, by means of manipulation and change of pouring speed, should be made to flow cooler until the mold is over half full. The top third of the ingot should be poured at the hottest temperature possible. All this is said by F. Pacher in an article in *Stahl und Eisen*, May 2, 1929, on "The Casting of Steel Ingots."

Unfortunately, means do not exist for raising the temperature of the metal in the ladle while pouring, and the ideal conditions can only be approximated by bringing up another ladle with hotter metal to complete the teeming of the ingot. The ideal freezing conditions, which would consist in the mass of metal being of uniform temperature throughout and cooling at a uniform rate, are likewise unattainable.

Mr. Pacher describes also a method of compressing ingots while liquid in the mold. It appears to be a modification of the Harmet process. Pressure is applied at the bottom of the ingot before solidification in a mold tapering upwards. The ram is in three parts, telescoping one within the other. The whole ram, as one unit, is first driven up a short distance, then the two concentric inner rams are forced up a further equal distance, and, lastly, the movement is continued by the central ram alone. The central liquid portion of the ingot is thus pressed upward to prevent the formation of a shrinkage cavity in the top part of the ingot.



Baldwin Machine Shops Work to Erecting Form Accuracy

THE building of any machine having many interdependent parts demands close attention to fits and alinement, but further difficulties are added when some of the members are extremely large and massive, as is the case in the modern locomotive.

At the Eddystone, Pa., plant of the Baldwin Locomotive Works, responsibility for alinement and accuracy of fits is concentrated in the machining departments. All parts and assemblies however huge or intricate must be finished in the shop to such predetermined limits that no hand fitting is required on the erecting floor. And, erecting forms designed to reject inaccurate parts automatically are the stern monitors of all machining and subassembly operations.

Side frames and cylinders, frequently of gigantic proportions and calling for very large machine tools and massive work-holding fixtures, are impressive examples of the working of the shop departments to erecting form requirements.

Such pieces require plenty of room for handling, and the shops in which they are processed not only have ample space between machines, but have aisles that accommodate standard gage railroad cars and auto trucks. In fact, it is not uncommon for visitors to view the various operations in these shops from their seats in the plant automobiles or station wagon.

Machines Side Frames 45 Ft. Long and Weighing 22 Tons

Main side frames 45 ft. long and weighing 44,000 lb. are not uncommon. The shop in which these steel castings are machined is rectangular, and operations are progressive, with no back tracking. Frames arriving from the foundry on railroad cars are either put into production immediately or piled at the receiving end of the shop to await the preliminary laying-out, which is the first shop operation. In this laying-out the castings are measured to assure that they will clean up properly, that is, machine to size.

From the layout table the frames go to the planer department, conspicuous for the two 96 x 96-in. x 50-ft. and eight 84 x 36-in. x 50-ft. planers surrounded by a number of smaller machines. Each frame planer has two rail and two side heads, and the sides and tops of two frames are rough and finish planed simultaneously at one set-up. The planing of two frames is shown in Fig. 1.

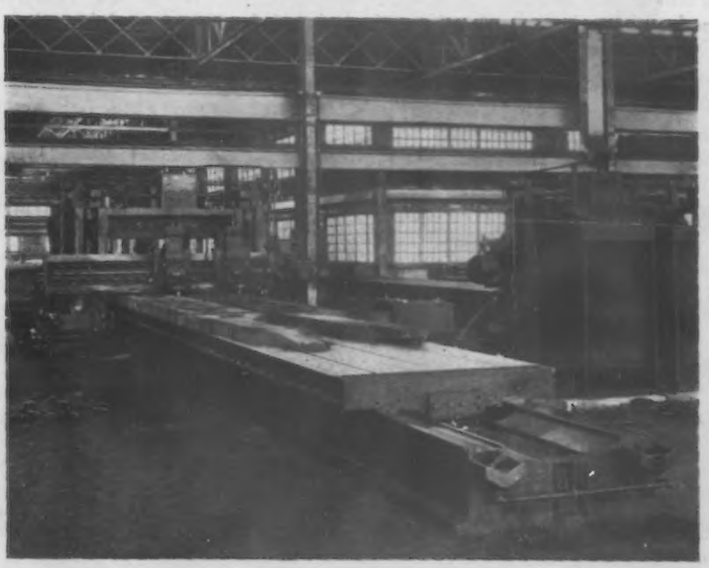


FIG. 1—Planers Having Two Rail and Two Side Heads Rough and Finish Two Frame Members at One Set-Up

A second layout operation follows planing. In this the pedestal ways, pedestal cap lugs and the other parts to be machined, except the holes to be drilled, are scribed, the straight leg of

the forward pedestal being the finished surface from which the layout man works.

Large Frame Slotters Shape Pedestals and Other Parts

The frames are then taken to one of a battery of triple-head locomotive frame slotters which shape the pedestals and contact points of six or eight frames at one setting, as shown in Fig. 2. These machines, of impressive size, are said to be the largest ever built. With the frames clamped against an angle plate, each machine slots the ways of three pedestals simultaneously and also the pedestal cap bearings, cylinder bearings, frame fits, etc. Angular cuts are made possible by the swiveling type heads of these machines. Special steel templates used during machining assure accuracy of form of the pedestal opening and tramming calipers are used for checking the distance from one pedestal to another.

Frames requiring cross planing of cylinder fits, cut-outs, etc., are taken, after slotting, to traversing shapers. Holes for filling pieces, pedestal caps, cylinders, brake work, etc—from 60 to 130 of them, ranging in size from ⅞ to 1⅝ in. and larger,—are then drilled. This work is done on a battery of double and triple-head frame drills, a base surface, the fitter by means of a "fish line," makes a final check on the alinement of the pedestal caps on the frame. The cylinder fits are hand scraped to micrometer dimensions. With the machining and fitting completed the frames are delivered to the erecting department.

Cylinder Machining Checked At Every Stage

CAREFUL workmanship on pieces of impressive size is also to be seen in the cylinder machine shop of the Baldwin plant.

Cylinder castings weighing six tons and more are received direct from the steel or iron foundry on standard gage cars and are processed progressively, finally being shipped to the erecting shop at the point of entrance into the cylinder department.

In this case also, layout is the first step. The casting is placed on a large layout plate in the position used in the locomotive, and is checked to assure that all parts will true up properly. The locating or base point from which all dimensions are scribed is, of course, the cylinder proper.

The first machining operations are boring the cylinder

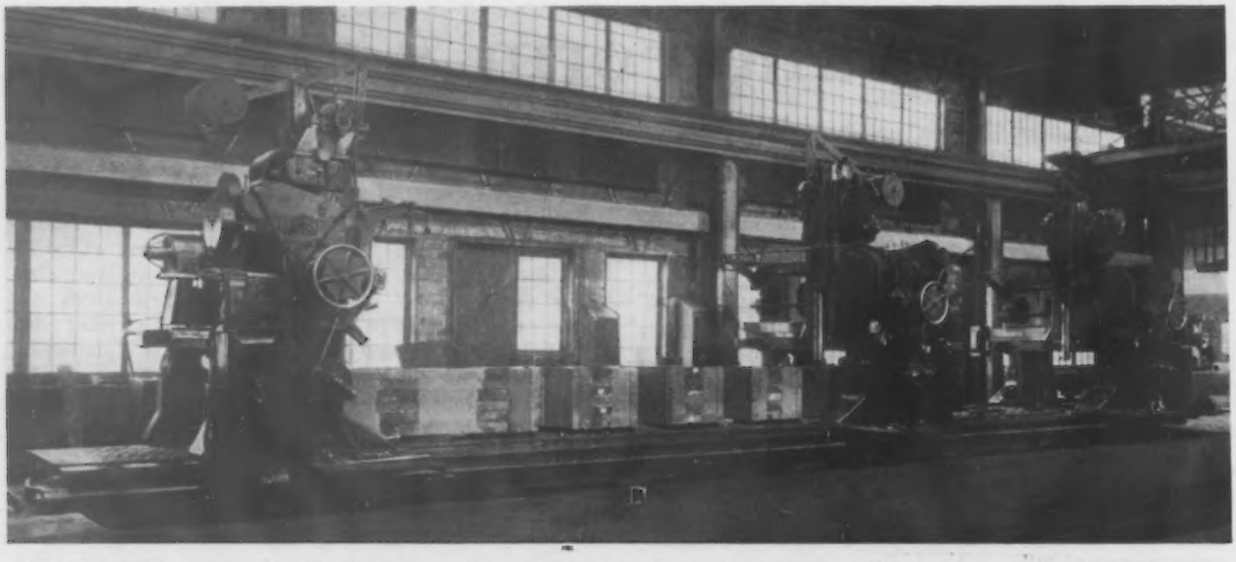


FIG. 2—After the Planing and Second Lay-Out Operations, the Frames Are Taken to the Triple-Head Slotters. Here, the pedestals and contact points of six or eight frames are shaped at one setting

Fig. 3, designed to take pieces 50 ft. long, and having one swiveling head for drilling at an angle. One group of these machines is used for flat work, while another group drills the top edge of the frame. While being drilled the frames are held against an angle plate.

The next step, an important one, is fitting up. Operations include chipping out and filing of various corners, fitting of the pedestal caps, and reaming the pedestal cap bolt holes, the reaming being done from the top down because of the taper of the holes. Layout of frame fittings, such as spring hangers, bumper knees, spring seats, etc., is also done by the fitting gang.

Fitting of pedestal caps is shown in Fig. 4. With the frame rigidly clamped to the lining-up form, bottom side up, from two to four fitters work, according to the number of pedestals on the frame.

When the fitting is completed and the alinement of the pedestal caps approximately correct, the frame is removed from the lining-up form and placed on its side on trestles. The pedestal ways are then checked for accuracy of form by means of template gages and the pedestal caps remounted. Then, using the cylinder fit as barrel and facing the ends, which are done on horizontal boring machines, Fig. 5, a roughing and then a finishing cut being taken. The barrel is held to limits of plus or minus 0.003 in. for out-of-round or taper. The cylinder casting then goes to a group of planers for rough and finish planing of the splice flange and frame fits. Two cylinders, right and left, or mating halves, are mounted on one bar, and supported on the planer table by a special fixture developed by the company. The accuracy of this planing operation on these huge pieces is noteworthy.

In the next operation, the valve chamber is bored, the machines used being similar to those for boring the cylinder barrel. In this set-up the valve chamber is accurately alined from the splice flange and frame bearings. Next in the production line are small boring mills, on which steam pipe and feed water connections, by-pass valves and other parts are machined. Short-work planing on such parts as the boiler flange, frame key, lug bearings, etc., is the next step, completing what is known as the heavy machine work.

Subsequent operations, all progressive, include drilling some 160 holes in the cylinder casting. For this work

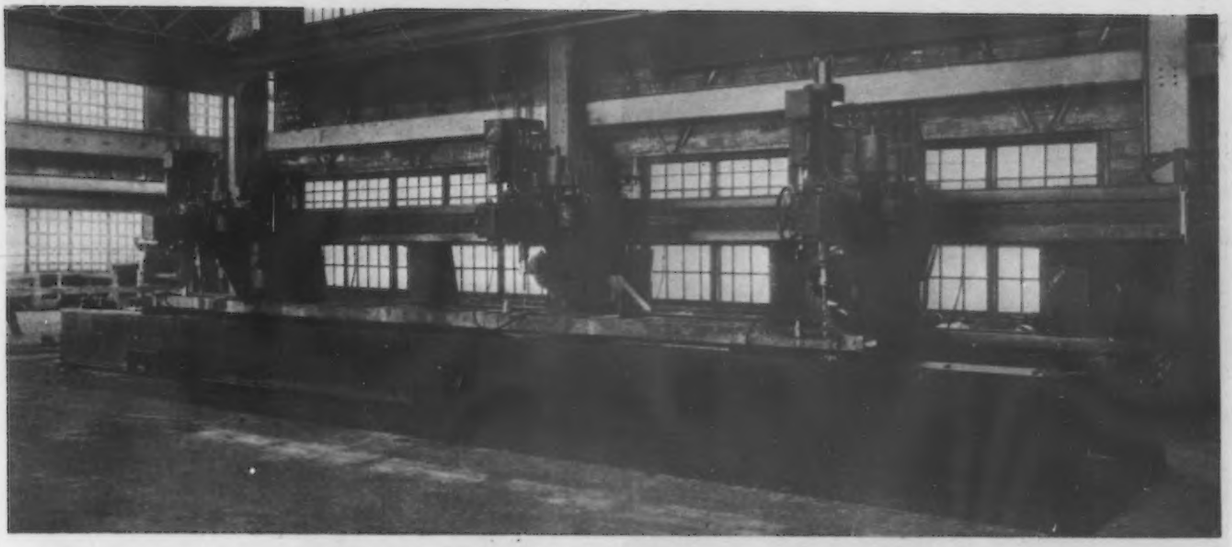


FIG. 3 (above)—From 60 to 130 Holes Are Drilled By These Massive Frame Drilling Machines. One head swivels for angular holes

FIG. 4 (left)—Fitting of Pedestal Caps Is an Important Step. The frame is rigidly clamped to the lining-up form, bottom side up. After other fitting and inspection operations, the frames are delivered to the erecting department

FIG. 5 (below)—Boring the Cylinder Barrel and Facing the Ends Are the First Machining Operations in the Cylinder Department

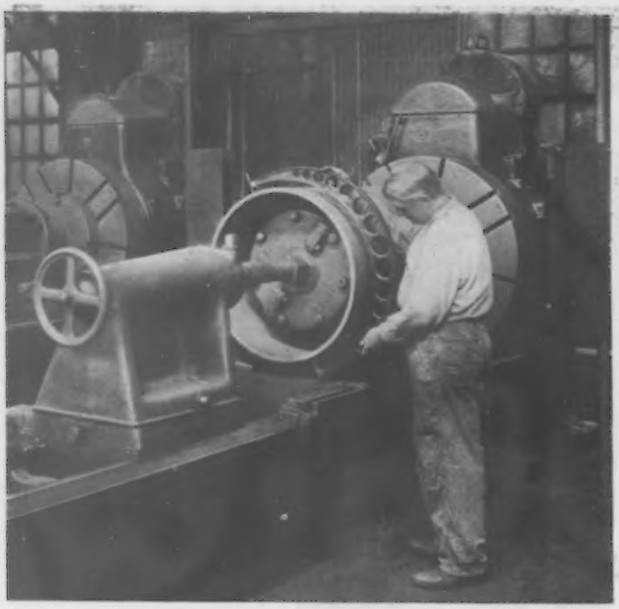


FIG. 6—Cylinder Bushings Are Turned on Lathes Equipped with Expanding Mandrels

there is a battery of 30 or more radial drills, each with a pit in front of it into which the work is lowered to bring the part drilled to little more than floor level. Where tapping is required, as on stud holes, peep holes and pipe holes, the same machine taps as well as drills. Drilling is progressive along this long line of machines. one group of holes being drilled on one machine, another group on another machine, and so on.

Hydrostatic testing of the cylinder castings follows the drilling and tapping operations. In this test the heads are put on, all openings blanked off and 250-lb. water pressure applied. It is required that the cylinders be watertight before the bushings are pressed in.

Connected with the cylinder machining shop is the bushing production department. Bushings are made to fit individual cylinder barrels and valve chambers, the size of which are taken by means of inside micrometers after the hydrostatic test. From 0.012 to 0.014 in. over cylinder bore size is left on all bushings to insure pressing fits.

These bushings are castings made from special iron. The valve bushings are first roughed on vertical boring mills to ⅛ in. of finished size and then taken to a layout plate for laying-out the ports. Holes are drilled within the scribed lines and the port openings then finished on a slotter. The cylinder bushing is mounted on an expanding mandrel on an engine lathe shown in Fig. 6, and turned to finish size to suit the cylinder chamber in which it is to be used.

From the lathes the bushings go to the fitting department where they are pressed into the cylinder by means of hydraulic equipment arranged as shown in Fig. 7. Definite pressures are specified for each size of bushing. The lined cylinder is then rebored and the cylinder head, valve head and steam pipe and other fits are ground to assure steam-tight joints.

At this point the right and left-hand cylinder castings are ready for assembling, which is done on a special form, made up of surface plate, angle plates, ground bearing blocks for the cylinder frame and other parts. When the cylinder castings are properly lined up and clamped, the splice flange holes are reamed and the bolts inserted and tightened. The assembled cylinders are now ready for planing the boiler fit, a large planer having a special head that permits machining boiler fits of different radii being used.

Final Inspection Recorded

The huge castings, completely machined and bolted together for erection, are finally delivered to the inspection department, located close-by, where the entire assembly is checked by gages of various types, all significant dimensions being recorded. A separate inspection is made at this point by the inspector of the railroad for which the locomotive is being built. As soon as he has passed on the work, the completed cylinder is loaded on a car and shipped to the erecting shop as per schedule.

While not produced on a mass production basis, these huge locomotive parts proceed through the machine shops with dispatch. Feeds and speeds that shorten machining time have been closely studied, and numerous workholding devices have been developed to facilitate operations. But workmanship to erecting form standards, not speed, is the first law of the plant. Thus are the wastes due to hand fitting and rehandling of large and massive parts eliminated, and thus the economical scheduling of production and simplification of erecting are obtained.

A little book on "Metal Pickling" has been written by E. E. Wynn and published by Charles Sever, Ltd., Manchester, England (price 2s. 6d.). It discusses in nontechnical terms this important subject, so much neglected in the trade literature or so obscured by chemical and mathematical discussions as to be lost upon the uninitiated. Unfortunately, the present book, containing only 32 16mo pages is so brief that only the commonly understood or obvious facts are mentioned.

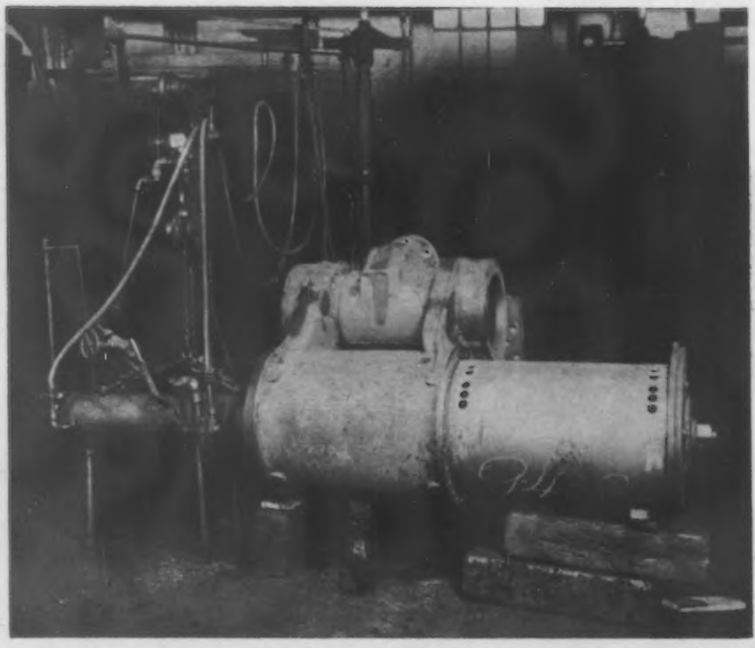


FIG. 7—Finished Bushings Are Hydraulically Pressed into the Cylinders. Definite pressures are specified for each size of bushing

Practice in Making Duplex Steel

Methods of Control of Slag and of Oxidation—Elimination of Twice as Much Phosphorus as in Ordinary Basic Practice

BY J. E. CARLIN*

DUPLEX steel practice, which combines the rapidity of the acid Bessemer with the dephosphorizing power and close control of the basic open-hearth, is interesting both from a chemical and an economic viewpoint. It is carried out usually in a tilting Talbot furnace of 100 to 300 tons capacity and was designed originally for the rapid manufacture of low-carbon steel of tonnage quality.

Certain refinements have been developed recently and the process is now capable of producing steel of any carbon content, of a quality which approaches and, with good practice, rivals that of the regular basic open-hearth process. In common with the majority of steel-making processes, two factors of greatest importance are the slag and the charge.

Characteristics of the Slag

IN its function and composition the slag differs radically from that of the regular basic process. The most important slag function of either process is the elimination of phosphorus. The mechanism of this elimination has been shown† to consist in the oxidation of phosphorus to ferric phosphate and its subsequent neutralization by lime, according to the following reactions:

$$2P + 8\,FeO \leftrightarrow Fe_3P_2O_8 + 5\,Fe \quad (1)$$

$$Fe_3P_2O_8 + 3\,CaO \leftrightarrow Ca_3P_2O_8 + 3\,FeO \quad (2)$$

The algebraic sum of reactions (1) and (2) gives reaction

$$2P + 5\,FeO + 3\,CaO \leftrightarrow Ca_3P_2O_8 + 5\,Fe \quad (3)$$

which means that the oxidation and permanent removal of phosphorus depends upon an excess of both ferrous oxide and lime, and it is further favored by low temperatures.

In the pig and scrap method of the regular basic process, a charge of approximately 50 per cent pig iron and 50 per cent scrap is generally used. Practically all of the scrap is of basic open-hearth manufacture, with a phosphorus content of approximately 0.015 per cent. The pig iron used is produced from basic ore and contains around 0.225 per cent phosphorus. In a 200,000-lb. charge there would be approximately 240 lb. of phosphorus to be removed.

In the duplex process the charge may consist of duplex metal blown entirely from basic pig iron. The phosphorus content of a 200,000-lb. charge would be about 450 lb. The slag of the duplex process, therefore, must be capable of oxidizing and removing twice as much phosphorus as that of the regular basic process. The iron oxide content is thus of necessity comparatively high, and for this reason sulphur elimination is retarded except when unusually large amounts of lime are added.

Immediately after the tap the slag for the next heat is made up. This is done by charging alternately roll scale and burned lime. The furnace is not emptied completely, and the heat of the residual metal serves to fuse the scale and lime into a homogeneous mass. The amounts of scale and lime charged have been determined by experience and vary with the quality desired and to a certain extent with the charge.

Proportioning the Charge

UNLIKE the regular basic process, the charge is usually completely molten and consists of duplex metal followed by approximately 10 to 20 per cent of its weight of pig iron. Duplex metal is the name given to the product of a Bessemer blow which has not been deoxidized or recarburized by manganese.

In the acid Bessemer process, it is possible to remove permanently practically all of the carbon, manganese and silicon initially present in the pig iron. Due to the absence of a basic slag, phosphorus and sulphur are not eliminated and it is found that their percentage composition actually increases, due to oxidation of the iron. This increase amounts to approximately 10 per cent.

Owing to the extreme rapidity of the process, it is difficult to stop the blow at a predetermined carbon content, and it is the usual practice to blow full, which means that the resulting product contains about 0.05 per cent carbon as a maximum, 0.10 per cent manganese as a maximum and a phosphorus and sulphur content some 10 per cent higher than that of the initial pig iron. Duplex metal may be produced from either basic or Bessemer pig iron, the only difference being in the phosphorus content.

Charging Blown Metal Into Furnace

Duplex metal is charged into the open-hearth furnace from ladles of approximately 25 tons capacity, as this weight corresponds to that of a Bessemer blow. The ladles may be either of the lip or spout variety, which means that, if the lip type is used, the duplex metal is poured from the top, while if the spout type is used, the metal is teemed from the bottom. A slag consisting of silica, iron and manganese oxides is produced in the Bessemer process; in tilting the converter at the end of the blow, a considerable amount of slag is of necessity run into the ladle with the metal. If the lip type of ladle is used, various amounts of this objectionable slag are then charged into the open-hearth furnace.

The amount of duplex metal charged is determined by the capacity of the furnace. As soon as the charge is complete, approximately 10 to 20 per cent of its weight of pig iron is added. This causes a violent reaction, owing to evolution of carbon monoxide, according to the following reaction:

$$C + FeO \leftrightarrow CO + Fe \quad (4)$$

The violence of the boil is determined by the degree of oxidation of the duplex metal, its temperature and the temperature of the pig iron. As a result of the vigorous re-

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†Bulletin 34, United States Bureau of Mines, C. H. Herty, Jr.

action the metal and slag are intimately mixed, and the high concentration of ferrous oxide, together with low silica, insures a rapid and practically complete oxidation and removal of phosphorus.

Interrelation of Iron Oxide and Carbon

At this point an interesting comparison with the regular basic process suggests itself. In the regular process, iron oxide in the form of iron ore is used to oxidize an excess of carbon, while in the duplex process an excess of carbon in the molten pig iron is used to reduce the iron oxide which saturates the duplex metal.

At present it is not practicable to determine the degree of oxidation of the duplex metal. Consequently the amount of pig iron necessary to effect complete deoxidation and to provide for a slight excess of carbon is more or less guesswork. The rate at which the iron oxide in the metal is reduced by the carbon of the pig iron depends upon the concentration of each and upon the temperature.

As soon as carbon is present in the metal it, also, is acted upon by the iron oxide in the slag. The diffusion and reaction rate is proportional to the concentration of the iron oxide in the slag, the viscosity of the slag and the temperature. Oxidation of carbon by the ferrous oxide already present in the metal, and by that which diffuses from the slag, proceeds simultaneously.

The rate at the start, or until the ferrous oxide and carbon in solution come near to equilibrium, is exceedingly rapid. The intensity diminishes as equilibrium is approached and, when a medium, uniform boil is present over the bath, it may be assumed that the carbon and ferrous oxide in solution are in practically equilibrium and that the reaction proceeds due only to diffusion of ferrous oxide from the slag.

The importance of regulating and controlling the amount of ferrous oxide in the duplex metal and in the slag cannot be overestimated. The composition of the slag is, of course, easily controlled, but that of the duplex metal is difficult. A duplex metal heat may be blown in a comparatively short time and, unless the flame is carefully watched at the end, overblowing to a great extent is possible.

Governing Extent of Oxidation

Ideal procedure would be to determine the extent of oxidation scientifically and then calculate the amount of carbon or pig iron necessary. This is not practicable as yet and the next best procedure is to add an amount of pig iron which is greatly in excess. This may be done by checking the carbon on a number of heats as soon as the violent reaction has subsided. This will give a rough indication of how much pig iron is necessary to leave an excess of carbon, which then can be oxidized slowly by the slag.

It happens sometimes that, due to excessive overblowing or insufficient pig iron, or both, the fracture test at the end of the heavy boil shows the carbon to be extremely low. This means that the ferrous oxide in the metal was sufficient to oxidize all of the carbon without the help of the slag. A heat tapped in this condition, even though sufficient coal or coke is added to bring it within the carbon specification, will be extremely wild, and is indicative of very poor practice. Good practice necessitates a careful watch of the violence of the boil and, toward the end of the heat, if the carbon is dropping rapidly, more pig iron should be added.

The duplex process offers an exceptional opportunity to study the rate of the reaction.

$$C + FeO \leftrightarrow Fe + CO$$

Although carbon is eliminated according to this reaction in both the regular and the duplex processes, in the regular process carbon elimination, except when ore is added, depends upon diffusion, which in turn depends upon temperature, composition and viscosity of slag.

Exact conditions of slag viscosity and temperature, from heat to heat, are difficult to duplicate and maintain. To study the reaction on a practical scale, it is necessary to provide a system which allows a knowledge of the temperature and the concentrations of both ferrous oxide and carbon in the metal at the start of the reaction. These concentrations should be such that the reaction is a considerable distance from equilibrium at the start. Such conditions would insure freedom from slag viscosity complications.

At present it is impossible to determine the temperature with an instrument, but it may be assumed constant within a fairly close range. In the duplex process the oxygen content of the metal may be determined and the carbon content calculated from an analysis of the pig iron and the total volume of the metal. In this manner slag viscosity may be disregarded; for it may be assumed that, until equilibrium between carbon and ferrous oxide in the metal is approached, diffusion of ferrous oxide from slag to metal is of little importance.

Thirty or 40 points of carbon may be eliminated in a comparatively short time and, during this period, the temperature may be assumed to remain constant. If the carbon and oxygen contents are determined at regular intervals and the results plotted on a time-carbon-oxygen diagram, interesting and practical information may be obtained. Due to the silicon and manganese content of the pig iron, the results obtained would be relative, but inasmuch as the concentration of manganese and silicon of the bath as a whole would be small, the results would not be affected from a practical standpoint.

Finishing the Heat

Ideal finishing conditions include

(1) Equilibrium between slag and metal with respect to iron oxide.

(2) A judicious use of silicon and manganese (determined by carbon content) to effect deoxidation as nearly as possible and to promote fluxing and elimination of the solid deoxidation products.

(3) A tapping technique which will provide a ladleful of steel before the slag comes.

(4) A minimum amount of slag covering the metal in the ladle.

(5) Dilution of the ferrous oxide concentration of the slag in the ladle by the use of burnt lime and spar.

(6) A temperature high enough to warrant holding the heat in the ladle.

Economy will not permit tapping the heats at equilibrium, but if the amount of scale charged is regulated with due respect to the charge, to the amount of pig iron added, and to the carbon desired, ideal conditions will be approached.

If it is considered that the carbon content and temperature determine approximately the amount of ferrous oxide in the metal, a ration of manganese to silicon may be calculated which will provide for maximum deoxidation and optimum fluxing of the deoxidation products.

Care and practice in plugging the tap hole will insure that the next heat will be tapped through a hole large enough to keep the steel at the right temperature, and yet small enough to hold the slag back until the ladle is practically full. If an early slag run occur, wildness in the ladle and excessive loss of carbon, manganese and silicon will result.

When the heat is in the ladle with its blanket of slag, diffusion of iron oxide from slag to metal takes place just as it does in the furnace. In theory, the rate of diffusion does not depend upon the amount of slag, but in practice

it is found that the amount is very important, especially when the iron oxide content of the slag is high. For this reason the amount of slag in the ladle should be kept at a minimum. It is possible to correct the harmful effects of a large amount of a highly oxidizing slag by the addition of a mixture of burnt lime and spar. This mixture should be added after the slag comes. Its purpose is to dilute the concentration of ferrous oxide, thereby checking diffusion.

A high finishing temperature serves to decrease the amount of ferrous oxide in solution for a given carbon content, and to decrease the viscosity of the metal. This decreased viscosity provides the best conditions for fluxing and eliminating the deoxidation products.

If the above practices have been followed, the various reactions should be in equilibrium and, if the temperature is high enough to warrant holding the heat in the ladle, this will promote complete diffusion and equalization of the ladle additions, and eliminate deoxidation products.

The superiority of electric furnace steel may be assumed to be due to the fact that the finishing slags are neutral or reducing. In electric furnace practice, when the carbon has reached the desired percentage, the oxidizing slag is raked off and a new slag made up of lime and coke dust is charged. By this method equilibrium between slag and metal with respect to iron oxide is assured, and sulphur elimination to a minimum is possible. Slag deoxidation is not attempted as yet in basic open-hearth practice, as slag volume in this process is very large and the phosphorus and sulphur content of the slag is generally much higher than in electric furnace practice.

The tilting open-hearth furnace offers the possibility, however, that this ideal may be realized in time. With the tilting furnace, it is possible to reduce the slag volume to a large extent. Suitable additions of spar and lime could then be made so that the iron oxide, phosphorus and sulphur contents would be reduced materially, with very little danger of the phosphorus and sulphur returning to the metal. All ladle additions could then be made in the furnace, with a very small loss of manganese, silicon or other ferroalloys.

This procedure could be worked up on tilting furnaces of around 50 tons capacity and, if found practical, then applied to the large furnaces which are in wider use.

*H*ERE Is Material Handling in the Virgin Forests of California. This notable example of photography shows no less than eight Holt caterpillar tractors all busy at the same time. As the publicity expert has it: "iron and steel machines roar, charge and defeat nature's obstacles."

Making Refrigerators on Conveyors

Several Types Used in Assembling and in Transferring Materials Between Departments

A PLANT expansion program, including the rearrangement of departments and the addition of several straight-line motor-driven conveyor assembly units, representing in all an investment of over $350,000, has been made by the Leonard Refrigerator Co., Grand Rapids, Mich.

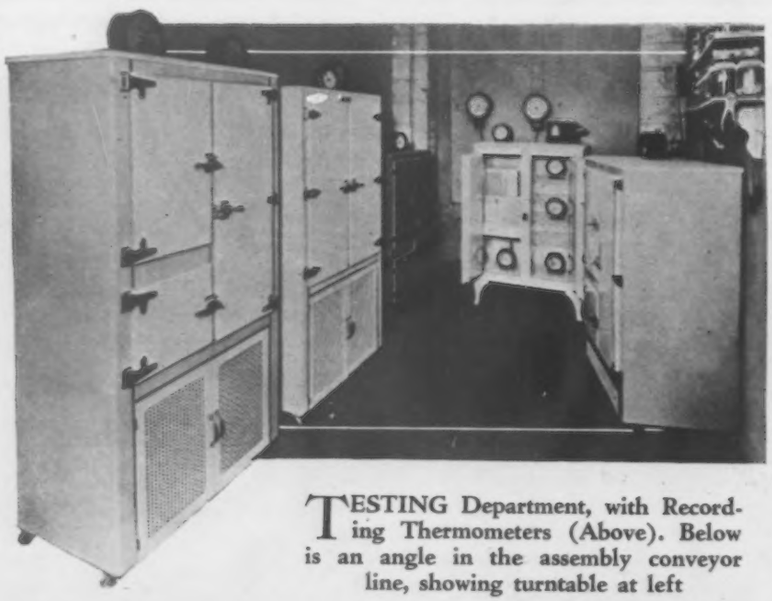
An entire new manufacturing plan is arranged around moving production lines, the cabinets being completely assembled, finished, minutely inspected, crated and conveyed to the proper place in the warehouse, ready for shipment, without being trucked about or moved by hand. The traveling production line shows every stage in the evolution of a completed refrigerator, from the original skeleton, plus insulation, sides, paneling, top, etc., to the completed product ready to go into a freight car or on one of the trucks used in delivering cabinets to dealers within trucking distance.

The longest production lines extend 705 ft. The line moves at a predetermined speed (which can be altered to suit conditions), The various operations being spaced sufficiently to give the necessary time for completion. The plan was worked out after careful study, to insure efficient operation of the entire arrangement. A tunnel under four railroad sidings connects the main assembly plant and warehouse, containing two automatic conveyor lines, one carrying finished cabinets to the warehouse, and the other bringing parts and materials to the production lines.

What is said to be the largest porcelain furnace in the world is being installed at the plant. This electric furnace, costing $65,000, has a capacity of 5000 sq. ft. of steel an hour. It was made after the special design of the Leonard company, to meet its particular requirements. A conveyor system operates through the furnace, the finished product coming out in an endless stream. The six electric porcelain furnaces, earlier installed, together with the new furnace, will have a daily production of 240,000 sq. ft., or 270 tons, which is double the former porcelain capacity.

Conveyors for Enamel and Lacquer

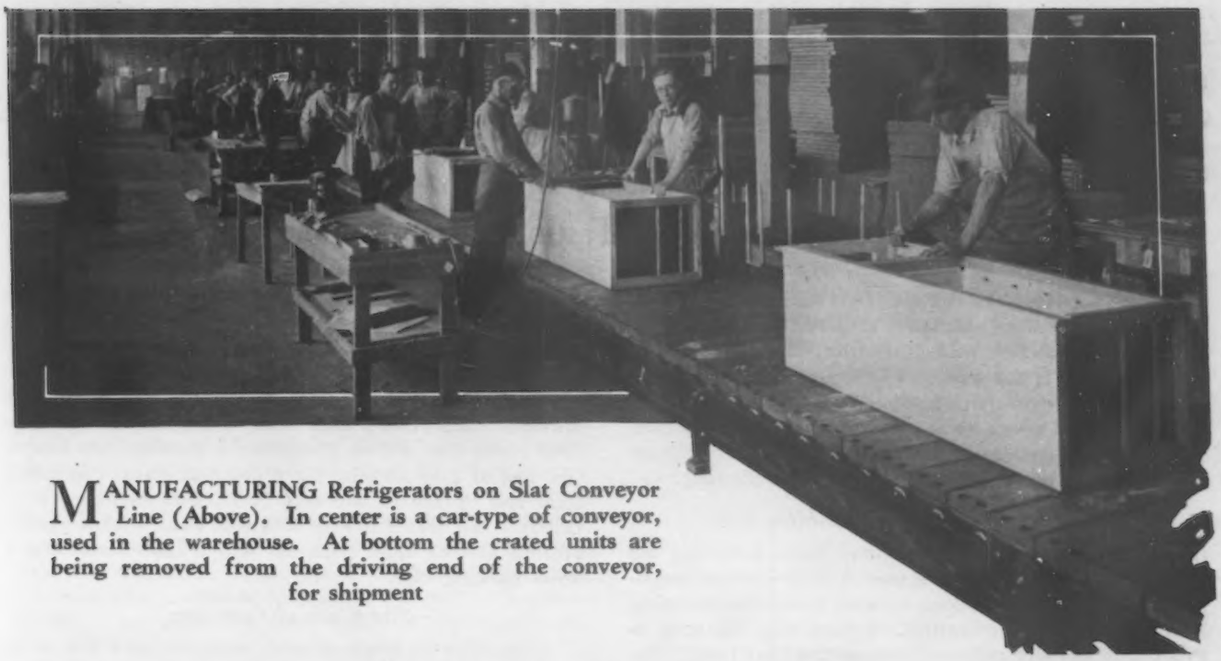
Two new drying and baking ovens, with conveyors, each 395 ft. long, are being installed to handle enamel and lacquer, including the new Frost Steel line. Other improvements include a 1000-ft. addition to the overhead tramrail conveyor system, connecting the various units of the Grand Rapids plant, expediting the movement of materials or machinery from one division to another. Three automatic, self-leveling elevators, operating at 125 ft. a minute, are being installed in the plant.



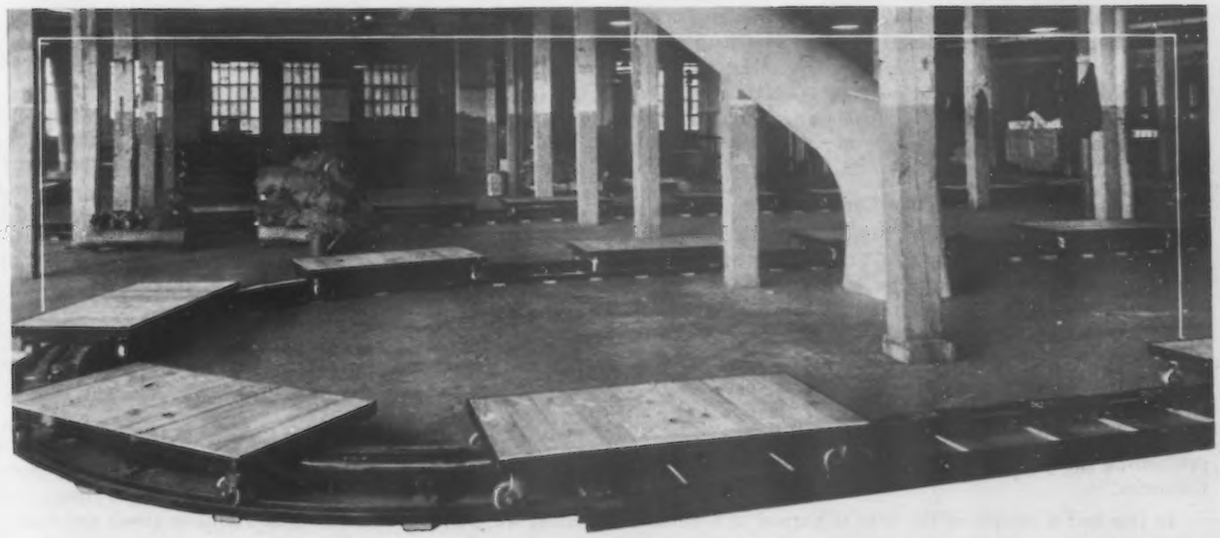
TESTING Department, with Recording Thermometers (Above). Below is an angle in the assembly conveyor line, showing turntable at left

Steel for All Cabinets

All of the new Leonard cabinets are of steel construction. Designed by experi-



MANUFACTURING Refrigerators on Slat Conveyor Line (Above). In center is a car-type of conveyor, used in the warehouse. At bottom the crated units are being removed from the driving end of the conveyor, for shipment



enced refrigerator engineers, every cabinet is insulated, and tested in the company's testing laboratory as well as by testing laboratories of leading national magazines.

Several of the illustrations show how the new method of manufacturing cabinets on conveyors functions. Movement is slow enough so that the necessary operations may be performed while the conveyor carries the materials, accumulating as the assembly progresses, past each successive working station. Differing types of conveyors are employed, to suit each different need.

The production capacity, with the completion of present improvements, will be 250 cabinets an hour, or 6000 per 24-hr. day. This is nearly three times the production capacity of 1929. Actual production costs will be reduced. In addition to producing the large volume of Leonard products, the company makes cabinets for several large mechanical refrigerator manufacturers.

Symposium on Automobile Materials

Latest Developments in Metals and Non-Metals Reviewed at Regional Meeting of Testing Society at Detroit

LATEST developments in materials for automobile manufacture were discussed at some length at a regional meeting held at Detroit, March 19, by the American Society for Testing Materials. Both metals and non-metals were covered. The metal papers embraced cast iron, plain and alloy; sheet steel, rustless steel, die castings, bearing metals, and aluminum alloys. The main points in these papers are presented in the following:

Cast Iron for Automobiles

MODERN automobile foundries have discarded old rule-of-thumb methods, said A. L. Boegehold, metallurgist, research laboratories, General Motors Corporation, Detroit, in his paper entitled "Present-Day Methods in Production and Utilization of Automotive Cast Iron." The cause of this development is the direct result of a scientific study of fundamental principles of the foundry business. The author rather exhaustively discussed measures employed to obtain a good product economically. These include testing molding sand; melting operations such as the standard cupola, hot blast cupolas and briquetted borings; control methods; properties of various irons, plain and alloy.

New Test for Coke Combustiblity

A new combustibility test for coke is an important part of Mr. Boegehold's paper. The first requisite of iron for pouring automobile castings is that it must be hot all day and every day for running the thin sections common to this class of work. By that is meant over 2700 deg. Fahr. When so much depends on this point, it is obvious that some sort of test for coke is desirable that will insure uniformity of coke quality. Such a test has been in use by at least one coke producer over a year for controlling the quality of coke supplied to General Motors foundries.

In this test a sample of the coke is burned in a definite volume of oxygen and the temperature rise and rate of temperature rise is measured. In the form of test now used the temperature rise resulting from burning one gram of coke varies with different cokes from 250 to 315 deg. Fahr. or more, and the rate of burning expressed in minutes for a 250 deg. Fahr. temperature rise varies with different cokes from 6 min. down to 1.8 min. It has been determined that a coke possessing a burning rate during this test of 2 to 2.5 min. for a 250 deg. Fahr. rise and a total rise of 280 to 300 deg. Fahr. will melt iron at a fast rate and heat it to over 2700 deg. Fahr. with a smaller amount of coke than required with a coke possessing a lower burning rate.

Five Kinds of Cast Iron

Five different kinds of cast iron are used for automobile parts, said Mr. Boegehold,—cylinder iron, flywheel iron, soft iron, permanent mold iron and piston ring iron. The paper gives the compositions, two of them containing small percentages of chromium and nickel, one containing 1 to 1.50 per cent nickel, and the remainder plain irons.

In addition to the gain in uniformity of structure obtained with a small percentage of nickel and chromium, addition of higher percentages of nickel has a beneficial effect upon the co-efficient of expansion of the iron. One car manufacturer found that cylinder blocks made of iron containing 1.50 per cent nickel improved the operation of the engine because of the smaller expansion and distortion of cylinder bore at operating temperatures. Fig. 3 shows the co-efficient of expansion for several types of alloy and plain cast irons. The values were obtained on specimens 1¼ in. in diameter by 14 in. long immersed in an electrically heated oil bath kept in constant motion.

Rustless Steel for Cars and Buses

FROM Dr. C. M. Johnson, chief chemist, Park Plant, Crucible Steel Co. of America, Pittsburgh, comes the latest word on the subject of the stainless steels and irons. He read in abstract an excellent paper, "Corrosion and

Some High Spots of the Symposium

ALLOY irons for automobile cylinders have the lowest co-efficient of expansion. Both nickel and molybdenum irons are suggested.—***Boegehold.***

RUSTLESS steels are "chromium plated and nickel plated all through." Frequent surface rubbing is essential to maintain corrosion resistance. Most important metals in the world for preserving iron and steel are, in order: Chromium, nickel and silicon.—***Dr. Johnson.***

ROCKWELL hardness test is an indication of the tensile strength of sheet steel. This test and the Erichsen will determine a sheet steel's suitability for forming.—***Graves.***

DIE casting industry owes its origin and its growth to the automotive industry, which today consumes more than half the output.—***Pack.***

Heat-Resisting Steels as Applied to Automobile and Bus Use." A brief valuable statement of the patent situation introduces the paper.

For valves the author states that the Armstrong creation occupies a prominent position as a heat-resisting material. It contains about 0.40 per cent carbon, 9 per cent chromium and 3 per cent silicon. Such valve steels must have sufficient hardness and strength at operating temperatures so that as the valve becomes heated and cooled alternately it will not become brittle and will retain its strength. The sil-chrome steel of Armstrong meets these conditions.

Resistance to Rust and Heat Corrosion

Steel that is "both nickel-plated and chromium-plated all the way through" is the description which Doctor Johnson gives of the so-called straight chromium-nickel steels of Strauss or the stainless or rustless irons (mostly 18 and 8). Acknowledging the broad uses for this material now being developed, the author states rather emphatically that it will need to "have its face washed" once in a while, because deposits of soot contain sulphates and chlorides which slowly act on these highly corrosive-resistant alloys. Doctor Johnson in one part of his paper discusses the action of ferric sulphate on these metals and offers some rather surprising data.

Steels which possess heat-resisting qualities are the straight chromium steel, the silicon-chromium steels, and preeminently the chromium-silicon-nickel steels, said Doctor Johnson, for valves and valve seats. Much data is contained in the paper covering composition and physical properties of the various heat-resisting and corrosion resisting steels and alloys; also on results of exposure tests on machining, welding, forging and heat treating.

Large Future for These Steels

There is promise of a great future for these steels and alloys in general, according to the author, in cutting down in a large way the billions of dollars lost through the rusting of ordinary steels and painting them. "The first cost of truly resistant steels is considerably higher, but when one considers the vastly longer life of the highly alloyed steels and the thin gages into which they can be rolled, and the tremendous cutting down of the losses due to rusting of the so-called cheap steels, there is much to encourage the use of steel of high resistance." As to preserving iron and steel, the most valuable metals in the world today are said to be: First, chromium; second, nickel; third, silicon.

Evaluating Good Sheets for Autos

TRYING it out in practice is the usual method of determining whether a sheet steel is suitable for being drawn into fenders or body panels. When failure occurs, however, it is impossible to definitely determine whether the failure was due to faulty design or set-up of dies, to improper press operation or to faulty steel.

Convinced that the art of testing metals has reached a higher plane than that of the design and use of forming dies, W. H. Graves, chief metallurgist, Packard Motor Car Co., Detroit, in his paper, "Sheet Steels for Automobiles," states that his laboratory has, as a result of five years' experiments, developed methods for testing sheet steel to determine in advance whether it will work satisfactorily in any given die.

Only two tests are needed, says Mr. Graves—the Rockwell hardness test and the Erichsen test. The former is an indication, within reasonable accuracy, of the tensile strength, and indicates the difference in pressure-ring setting needed for different steels as well as gives a measure of the degree of spring-back to be expected. The Erichsen test indicates the depth of draw that a sheet steel will stand as well as the character of its surface after drawing.

Specifications for normalized sheet steels for deep drawing and for extra deep drawing are suggested by Mr. Graves. Based on 18 or 19 gage sheet, Rockwell values for both should come within the range B-43 and B-53. Erichsen values should have a minimum of 10.5 for deep drawing and 11.0 for extra deep drawing.

Advances Made in Automobile Die Casting

ZINC-BASE alloys furnish a large percentage of the die castings for automobiles today, according to Charles Pack, consulting engineer, New York, in a paper, "Advances in Die Cast Metals for Automotive Use." The most suitable alloys for these purposes consist of zinc as a base containing small amounts of copper and aluminum

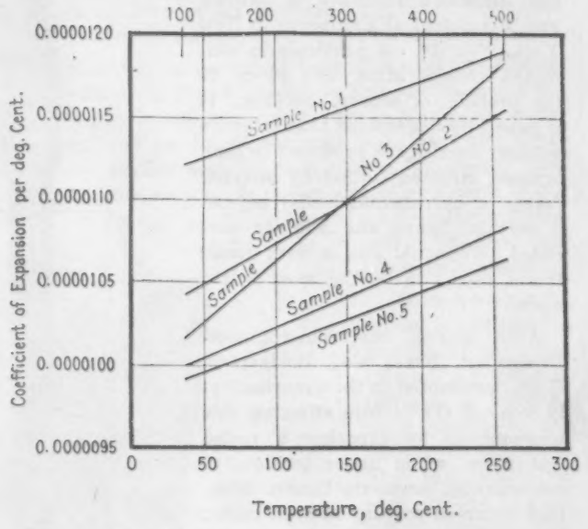


Fig. 3.—Expansion of Alloy Cast Irons

Chemical Analysis: Sample	Per Cent C	Mn	Ph	S	Si	Mo	Ni
No. 1 (Steel)	0.20	...	....	....	...	...	...
No. 2	3.25	0.59	0.093	0.091	2.22	...	...
No. 3	3.32	0.44	0.127	0.065	1.93	0.37	...
No. 4	3.26	0.43	0.116	0.064	1.89	0.73	...
No. 5	3.14	0.40	0.126	0.080	1.99	...	1.41

and in some cases magnesium. Ornamental hardware, speedometers, gasoline pumps, carbureters, radiator caps, oil filters are some of the parts made as die castings.

Control of the purity of the metals within narrow limits is of the utmost importance to prevent deterioration of die castings from growth or warping. Lead, tin and cadmium are particularly harmful to zinc-base die castings. The author suggests the steam test as being the best method of making accelerated tests of such alloys. Other vital factors are design of dies, construction of machines as regards proper gating, venting and cooling of dies. Other die casting metals discussed are tin, lead, aluminum, magnesium and copper-base alloys.

Two Base Alloys of Bearing Metals

TWO constituents are the first requirement of an alloy for a bearing metal—one hard and one soft, said Prof. Clair Upthegrove, department of chemical engineering, University of Michigan, Ann Arbor, Mich., in his paper, "Automobile Bearing Metals."

The greater part of the bearings used in automobiles are made of tin-base or copper-base alloys. The author suggests that there may be an unnecessarily large number

of compositions of bearing metals in use, and urges the securing of a standard test for bearing metals, which will give results truly representative of their qualities. Compositions of the representative bearing metals are discussed as well as the effect on structure of metal and mold temperatures.

An excellent paper on "Light Metals in the Automotive Industry" was read from manuscript by the author, Dr. Zay Jeffries, Cleveland. An abstract is printed on other pages.

"Recent Progress in Tests for Automotive Materials" was a paper delivered by Prof. H. F. Moore, University of Illinois, Urbana, Ill. A brief abstract will be published later.

Season Cracking of Brass Due to Stress and Corrosion

CORROSION under specialized conditions was discussed at the meeting of the Institute of Metals Division at the annual convention of the American Institute of Mining and Metallurgical Engineers in New York, Feb. 18. A particularly animated consideration was given to the problem of season cracking. It is generally understood that fracture without ductility is produced in high brasses, stressed (either by internal forces or by external loads) beyond a certain figure and slightly corroded. Ammonia gas in very small traces seems to be the most active agent.

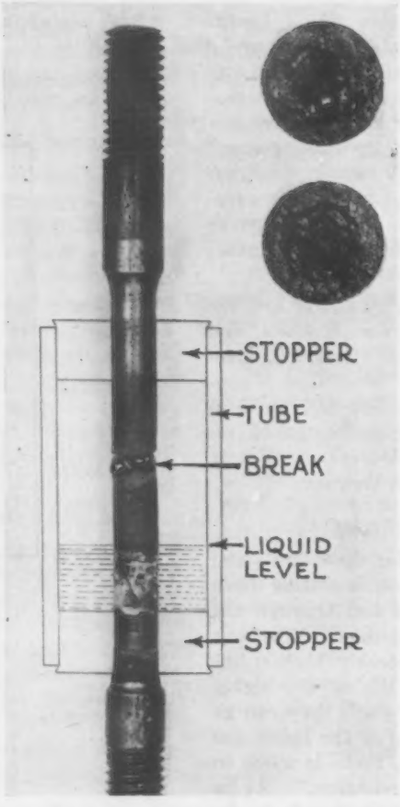
Alan Morris, research engineer, Bridgeport Brass Co., Bridgeport, Conn., attempted to fix quantitatively some of the factors affecting this phenomenon by exposing a round test piece, while under tension, to concentrated ammonia fumes. Fracture occurred rapidly on high loads; longer times were required with decreasing loads. Limiting values for a high grade 65:35 brass were as follows:

Annealed to 0.015 mm. grain size—10,000 lb. per sq. in.

Annealed to 0.065 mm. grain size—5,000 lb. per sq. in.

Naval brass (Cu 60, Sn 0.75, Pb 0.10) gave the following limiting values below which corrosion fractures did not occur after 700 hr.:

Quenched from 500 deg. C.—15,500 lb. per sq. in.
Air cooled from 500 deg. C.— 3,000 lb. per sq. in.



APPEARANCE of Fracture of Brass Induced by Mild Tension and Corrosion by Ammonia

Mr. Morris' conclusion that lead and tin in an alpha brass tend to accentuate corrosion cracking was doubted by others present. According to one speaker, lead is more or less innocuous as to season cracking, but promotes "fire cracking." The action of the insoluble lead particles in a piece of hot brass was likened to that of mercury in the conventional test for season cracking, both being foreign substances with the power of selective attack.

As a practical matter, brasses having 75 per cent or more copper seldom season crack. For instance, W. B. Price, Scovill Mfg. Co., said that when assembling pipe fittings made of high brass a torque of 20 ft.-lb. should not be exceeded (although plumbers experienced with iron pipe would invariably put more force into their work). His tests showed that fittings made of a hardware brass containing copper 89 per cent, lead 2 per cent and nickel 1 per cent, would show no fractures in the mercury test when assembled with torque up to 60 ft.-lb.

However, W. R. Webster, vice-president, Bridgeport Brass Co., said that a hard-worked 90:10 brass fabricated into skylight sash would season crack extensively within a couple of years when exposed to locomotive smoke.* W. H. Bassett, American Brass Co., said he had seen cases of season cracking in pure copper. Any strained metal is less noble than in the unstrained condition, and the tendency to corrode more rapidly is there, even though in most commercial applications the magnitude of the actual damage is too slight for harmful results. In practice, it appears that those alloys which exhibit the phenomenon of dezincification on corrosion are also the ones which are liable to season crack.

Additional data on this problem was given by D. K. Crampton, chief metallurgist, Chase Brass & Copper Co., Waterbury, Conn., in a study of "Internal Stress and Season Cracking in Brass Tubes." His conclusions are based on the study of internal stress by splitting a piece of pipe, three times as long as its diameter, and measuring the "spring back." He finds that the iron content in the brass has little effect. The tendency to season crack (as measured by the time required to crack in mercuric nitrate solution) increases directly with the intensity of internal stress.

Total immunity is attained with stresses below 12,000 lb. per sq. in., and practical immunity at 20,000 lb. per sq. in. He finds that the method of producing the tube has a pronounced effect (for instance, "sinking" is more damaging than drawing over a plug or mandrel), and concludes that, with proper mill procedure, practically any size of brass tube can be drawn to any commercial degree of hardness and still be free of any tendency to season crack, and therefore will require no "stress relief" anneal.

The difficulty of accomplishing this increases considerably with very thick-walled tubes. Furthermore, tubes in the high-brass range (60 to 70 per cent copper) are strongly susceptible to season cracking.

*F. L. Wolf, chief engineer, Ohio Brass Co., Mansfield, Ohio, presented at this same meeting a paper on "Corrosion of Alloys Subjected to the Action of Locomotive Smoke," describing tests of fittings for catenary line construction. Alloys which stand up well under various other forms of corrosion have failed when subjected to the corrosive action of locomotive smoke, particularly when in contact with other corrosion-resistant metal of different analysis.

Critical Temperature in Galvanizing

About 950 Deg. Fahr. Is a Point at Which Several Changes Occur—Less Action at 1000 Deg. Than at 950

BY WALLACE G. IMHOFF*

DESTRUCTIVE action in a galvanizing pot was considered, in part, in THE IRON AGE of Feb. 27, page 634, where the disproportionate effect of increasing temperatures was briefly traced. The second installment of the story appears in the following paragraphs:

Results When Heated to 950 Deg.

Fig. 8 shows the melt of commercial slab zinc with a steel sheet in it heated to 950 deg. Fahr., held for 6 hr., and allowed slowly to become cold. These samples were extremely interesting in showing the destruction of the iron sheet by the molten zinc in full action. This is indicated in Fig. 8 by the rows of alloy cones on both sides of the steel sheets.

There were so many important features of interest developed at 950 deg. that a special study was made of this melt. The alloy cones have been mentioned. They were a brilliant, greenish-golden-yellow color and were not fastened to the sheet tightly. During the preparation of the specimen a number of them came loose from the iron sheet. They were later analyzed to discover their composition. The scum and zinc oxide are plainly shown in both specimens. Note how this oxide is closely wrapped around the alloy cones.

Fig. 9 shows a polished and etched cross-section of one of these alloy cones. It is most interesting in that it shows four distinct zinc-iron alloys. The main body of the cone is one zinc-iron alloy; the light cracks at the top of the cone are another zinc-iron alloy; the cracks in the black area appear to be another zinc-iron alloy; and the fourth is the black area in the upper right of the cone. Those interested in pure research would find a world to talk about in these specimens, but here we will keep more to the practical side of the research. Five or six of these alloy cones were analyzed and found to contain 4.24 per cent iron (average).

Fig. 10 is a cross-section of the entire melt at 950 deg. The melt shown in Fig. 8 was cut in half and the surfaces, after polishing and etching, show what is happening to the steel sheet. At the top of the melt very large zinc crystals can be plainly seen on each side of the sheet. The action is plainly shown. It is remarkable how close to the sheet the alloying action of the zinc has been confined.

Due to the increase in the specific gravity of the zinc-iron alloy which is formed, it immediately settles to the bottom of the melt. This can readily be seen by the large pile of zinc-iron alloy at the base of the sheet. The whole bottom of the melt is alloy. Some iron-rich black crystals are also seen to have separated out in this alloy at the bottom. Very interesting facts are brought out by examining some of these features under higher magnification.

The extremely destructive action of the molten zinc upon the steel sheet, and the disintegration of the zinc-iron alloy into small fragments, are plainly to be seen in Fig. 11. This magnified view of the end of the sheet shown in Fig. 10 shows at once why galvanizing pots are rapidly destroyed under practical conditions of

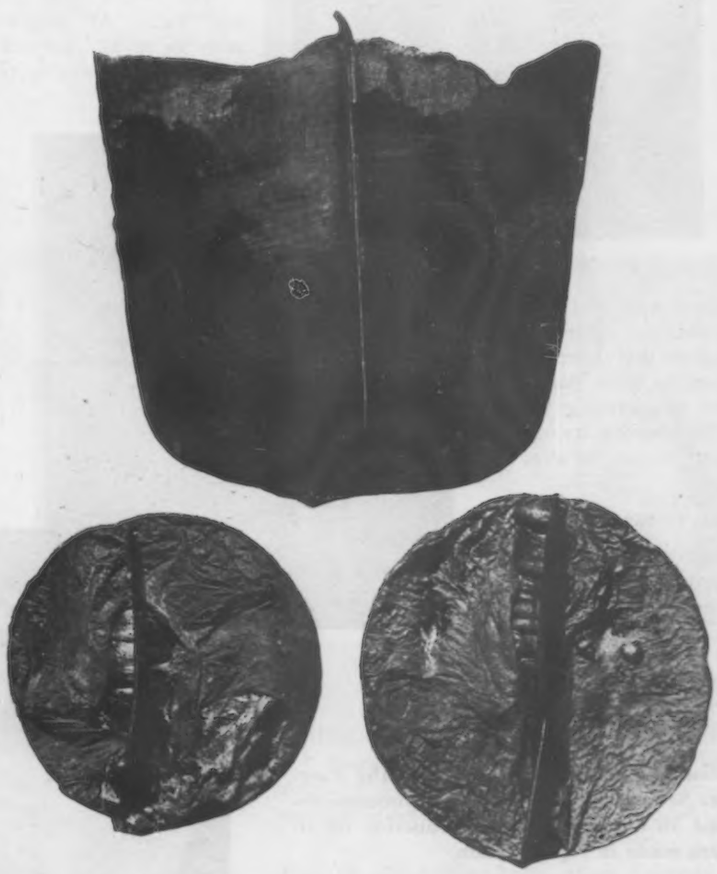


FIG. 8—(Lower Pair) Commercial Slab Zinc with Steel Sheet in It Heated to 950 Deg. Fahr., Held for 6 Hr., and Allowed Slowly to Become Cold. Note the zinc-iron alloy cones formed on each side of the sheet. Magnified 2 diameters

Fig. 10—(Top) Cross-Section of Melt Shown in Fig. 8. Magnified 3 diameters. Both cuts reduced 31½ per cent in reproduction

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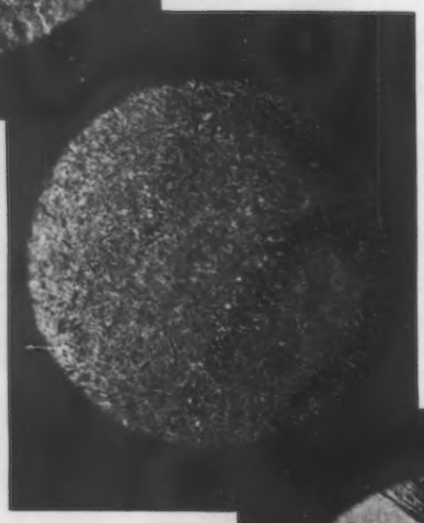
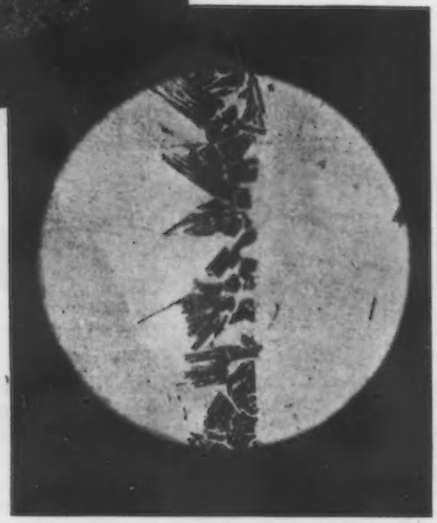




operation. The full mechanism of destruction is in action, and is clearly shown. Above 900 deg. the dissolving action of the zinc becomes violent (the iron goes into solution rapidly). The iron first enters the iron-rich zinc-iron alloy, and this is quickly disintegrated into fragments.

Attention is called to the very thin band of iron-rich alloy at this temperature. Compare it with that of Fig. 5, only 50 deg. lower, and note the difference in the power of disintegration at the higher temperature. It should be kept in mind that this same power of destruction is operating under practical conditions when the temperature of the metal in the galvanizing pot reaches 950 deg. in any part of the kettle.

Critical Temperature Is 950 Deg.

Since this is a critical temperature, and brings out some very important facts due to the extreme contrast of the action of the molten zinc with its action at lower temperatures, a little more time will be devoted to the details of what has happened.

Attention is first directed to the zinc-iron alloy immediately under the sheet. This is clearly shown in Fig. 12. The usual standard magnification of 36 diameters has been used. The purpose of this standardization of magnification will be brought out later. This plate clearly illustrates the broken fragments of the iron-rich zinc-iron alloy. Fig. 11 shows a cross-section of the sheet, and Fig. 12 a section at right angles to this, and directly under the sheet.

In Fig. 10, at the top of the plate, at the right of the sheet in the clear zinc area, some crystals may be seen. Just how they got out there into the clear zinc area the writer cannot say. Fig. 13 is an enlarged view of these crystals, which shows them to be fragments originally from the side of the sheet.

Down at the bottom of the sheet, a little to the left below the end in Fig. 10, may be seen two dark, almost black crystals. These crystals are magnified and shown more clearly in Fig. 14. Attention is called to the crystal forms in the small group between two large black crystals, near the top of the plate. Here is an interesting question: "Are these crystals forming again from the small fragments, or are they larger fragments disintegrating, and which have been thrown off from the sheet too rapidly to be dissolved slowly?" As there are many harder ones yet to come, time will not permit a discussion of the purely theoretical side of these investigations.

Reduced Action Found at 1000 Deg.

Fig. 15 is a cross-section of the melt at 1000 deg. Fahr. All conditions were exactly the same as in all previous tests. Something has happened. According to the test there is less action at 1000 deg. Fahr. than at 950 deg. But why? That is another hard question which there is not time to discuss here.

By looking closer at this plate an additional feature is to be seen and remain unexplained. Note that the two sides of this sheet are not dissolving at the same rate. Careful observation shows the

▲ ▲

FIG. 9—(Top) Polished Cross-Section of One of the Zinc-Iron Alloy Cones Seen in Fig. 8. All these photomicrographs were magnified 36 diameters, and a reduction of 30 per cent made in reproduction

Fig. 11—Commercial Slab Zinc with Steel Sheet in It Heated to 950 Deg., Held for 6 Hr., and Allowed Slowly to Become Cold

Fig. 12—The Iron-Rich Zinc-Iron Alloy Directly Under the Sheet Shown in Fig. 11

Fig. 13—(Bottom) Fragments of Zinc-Iron Alloy Crystals Seen at the Upper Right Near the Sheet in Fig. 10

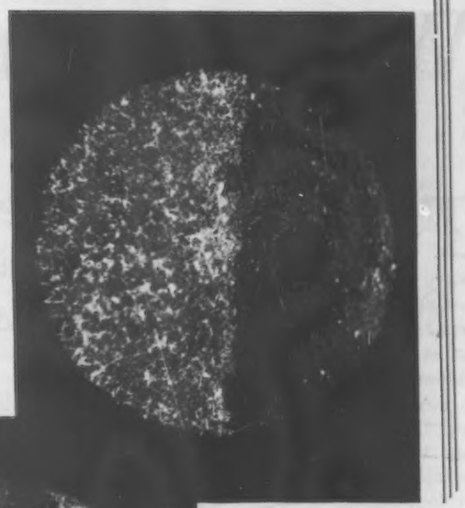
alloy and the crystals on the left to be very different from those on the right. Those on the right are exactly like those formed at 950 deg., the alloy band is narrow, and the crystals quickly disintegrate. Note, however, that the alloy on the left is of a different character, very much wider, not so much disintegrated, and lines seem to radiate into the sheet. The right side is dissolving faster than the left, but for what reason? Why? In the light of practical pot destruction, this question is important.

Fig. 16 is of the alloy directly under this sheet at 1000 deg. From the looks of the alloy it is evidently under the sheet at the right side. The breaking up of the solid alloy into the smaller crystals and fragments can be plainly seen. The iron-rich zinc-iron alloy is the dark area at the left of the plate; the zinc-rich part of the melt is at the right.

Fig. 17 is a cross-section of the melt at 1100 deg. The action is again strong and the heavy thickness of the iron-rich alloy on both sides of the sheet show that it is being attacked the same on both sides. A pertinent question is, however, "Why is this alloy so thick?" At 950 deg. there is no alloy; at 1100 deg. there is a thick alloy. A significant fact is that the sheet itself now seems to have been changed entirely to zinc-iron alloy. It is no longer dark, but the typical alloy yellow.

Fig. 18 shows the alloy directly under the sheet of Fig. 17. The solid, dark part on the left again shows the solid iron-rich alloy, and the part at the right the breaking up of the alloy. Note the great difference in the thickness of the alloy as compared with that shown in Fig. 16, where the zinc in the melt can be seen at the extreme right. It is not visible in Fig. 18.

In the concluding section of this article the devastating action of the zinc at 1500 deg. Fahr. is taken up and conclusions are drawn as to how troubles from these causes may be practically avoided. Four specific thoughts, which should always be in the minds of galvanizers, are there outlined.



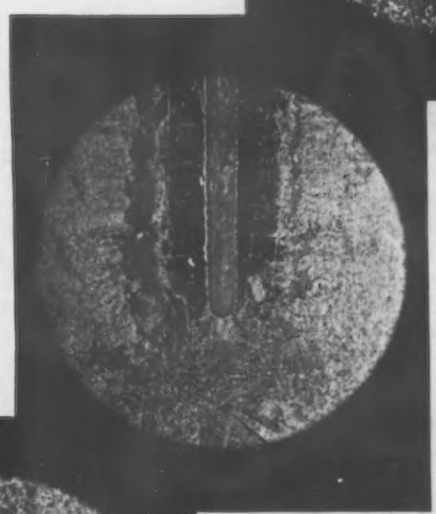
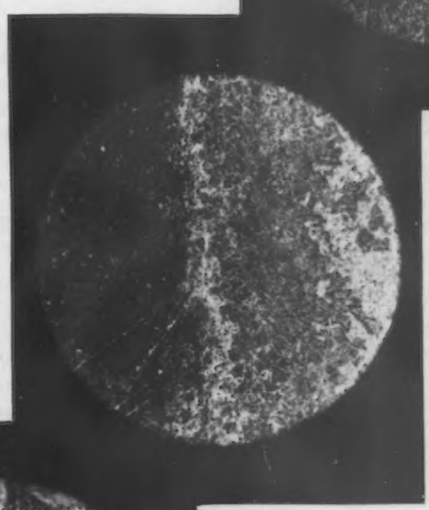


Fig. 14—Zinc-Iron Alloy Crystals at Lower Left of the End of Sheet Shown in Fig. 10. 36 diameters; reduced 30 per cent in reproduction



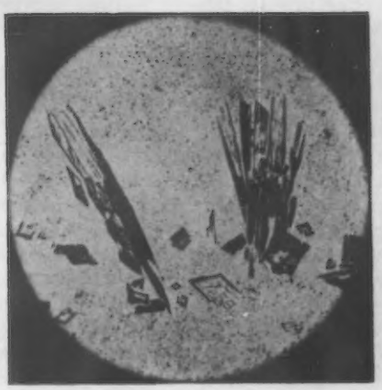


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FIG. 15—(Bottom) Commercial Slab Zinc with Steel Sheet in It Heated to 1000 Deg., Held for 6 Hr., and Allowed Slowly to Become Cold. These photomicrographs were magnified 36 diameters; reduced 30 per cent in reproduction

Fig. 16—The Zinc-Iron Alloy Directly Under the Sheet Shown in Fig. 15. It appears to be the right side of the sheet

Fig. 17—Commercial Slab Zinc with Steel Sheet in It Heated to 1100 Deg., Held for 6 Hr., and Allowed Slowly to Become Cold

Fig. 18—(Top) The Zinc-Iron Alloy Directly Under the Sheet of the Melt Shown in Fig. 17

Why Not Profits in Foundries?

By ALBERT WALTON*

Improved Plant Facilities, Adherence to Strict Specifications and Uniform Accounting and Cost Practice Will Lead the Way

THE most successful operation of a foundry, whether engaged in the making of castings for further conversion into machinery in the same plant or for the jobbing trade, is achieved by improving plant facilities, the making of castings to specifications, cooperation with competitors in adoption of uniform accounting and cost practice and development of sales policies that give the customers the benefit of cumulative engineering knowledge. Analysis of all the factors having a bearing on the profitable operation of a foundry is impossible on account of the differing applications of the product and the original physical layout, but a number of generalizations may be made.

A competent purchasing agent is indispensable. He must not only buy raw materials at the market prices, but must also cooperate with the management in making sure that pig iron, scrap, coke, molding sands, facings and other materials and supplies are up to the standard specifications required by the foundry's practice.

Melting Practice Basic

The first real operation in any foundry is the production of molten metal and, whether this is by cupola, air furnace, open-hearth or electric furnace, many problems peculiar to each type of melting practice are confronted. Whatever melting practice is followed in the individual foundry, many opportunities to acquire valuable pointers from operations are offered, but if the experiences of others are not utilized, many of the phenomenal developments made recently in the production of molten metal, both in the cupola and the open-hearth, will be lost. Although many believe that such developments have no serious application to their own problems, the engineering departments of all large manufacturing companies are continually calling for stronger and better metal in the castings to be used in building the machinery they require. Steel foundrymen know this is the case. The iron foundries are slowly waking up to opportunities lost during the last 25 years, when any cast iron with a tensile strength from 18,000 to 20,000 lb. was considered sufficient. Now a tensile strength of 30,000 lb. and upward for ordinary gray iron, and as high as 65,000 to 70,000 lb. for alloy iron, is regularly obtained.

Modern iron foundries, as are the steel foundries, are well posted on alloy metals, including rustless varieties and high tensile and high wearing quality irons for specification work. Foundries that do not know these new outlets for their business have only themselves to blame if their market is restricted through their own inability to furnish the high-grade product now required by contractors and engineers.

Therefore, it is important not to neglect molten metal practice and to be prepared to meet the requirements of engineers and others in producing high-grade metals. It means a profitable business if the practice is correct and not wasteful in detailed operative practice. Charged metal should be of the proper components to give the desired quality. Fuel should not be wasted in melting, and positive control of melting temperatures and of the chemical analysis of raw materials and molten metals is essential. Melters and men in charge of pouring molds must know the proper temperature at which the metal should be poured to give good results.

Supervision Important

Probably the most expensive operation in any foundry is that of molding. One of the most important problems is that of securing and training molding and coremaking apprentices. It is also necessary to have competent supervision in the foundries. In a properly directed foundry the supervisor will aid greatly in reducing the number of defective castings, as well as in speeding up the molding, coremaking and other operations. If workers of ordinary ability must be employed, there is all the more reason for having good supervising foremen. Some foundries have

*Consulting engineer, United Engineering & Foundry Co., Pittsburgh. From a paper delivered before the Pittsburgh Foundrymen's Association in Pittsburgh, on March 17.

- Lack of handling facilities is the principal cause of high cost in a foundry.
- Two classes of foundries take work at low prices. One type lacks satisfactory cost methods, the other can quote low because of superior methods and equipment.
- Close supervision is important. It has reduced foundry losses to less than 2 per cent of the total weight charged.
- Charged metal should be of proper components to give the desired quality.
- Fuel should not be wasted and positive control of melting temperatures is essential.
- Melters must know the proper temperature for pouring.
- Reclaiming heap sand results in large savings. Consumption of new molding sand can be sharply reduced.

been successful in holding down their losses to less than 2 per cent of the total weight charged. If the foremen are not aggressive in watching the various operations and in using economy consistent with the best floor practice, considerably more work than this will be lost.

Foundry and pattern shop foremen ought to collaborate at all times on the best method of making patterns to meet foundry floor practice. Collaboration is always necessary in foundries that maintain an engineering department. It is also obligatory on the part of all companies operating an engineering department in connection with their pattern shop, foundry and machine shop to have their engineers familiar with the best practice in these three important manufacturing divisions. This might be accomplished by assigning certain engineers or squad leaders to shop work for periods that will be sufficient to acquaint them with actual operating methods, and it is bound to result in many economies in design that will increase production and reduce cost.

Economies in Molding Sands

In actual molding and coremaking operations the first factor that has a bearing on economical production is molding sand. Much has been accomplished in both iron and steel foundries in reducing the cost of handling molding sand; also through re-treating used sand and eliminating the fines that affect permeability and also are often the source of serious dust hazard, especially in cleaning and chipping occupations. It is possible now to reduce the consumption of new molding sand as much as 80 to 90 per cent. In one foundry new molding sand has been reduced to 5 per cent of the quantity previously purchased and similar experiences have resulted wherever a systematic attempt has been made to standardize and retrieve molding sands. With such practice developed along proper lines, the quantity of defective castings is reduced and the surface appearance of the castings is improved.

Indicative of the progress being made in the production of synthetic molding sands are the records of foundry supply companies that furnish clay for bonding sharp sands. One producer shipped 30,000 tons of bond in 1927 and 50,000 tons in 1928. Another shipped three times the quantity in 1928 that it did in 1927. One of the largest operators in the East is preparing to bond sharp sand of various grain sizes with the percentage of bond required by its customers, and also has prepared standard mixtures for a number of large companies by the thorough preparation of natural bonded sands.

The cost of reclaiming and rebonding heap sand on a large scale ranges from 75c. to $1.50 per ton of sand handled, and the cost of manufacturing molding sand from sharp sand of requisite grain size and fusion point is only slightly more than the cost of reclaiming heap sand. When large tonnages of new molding sand are used a reduction of $2 to $2.50 per ton in cost is a sizable economy.

Introduction of Mechanical Methods

Much can be done by intelligent introduction of mechanical methods to replace hand labor in a foundry. Every laborer that can be eliminated represents a saving of approximately $1,150 a year of 250 working days, based upon a labor rate of 40c. an hour, and 15 per cent added to take care of cost of supervision. Every skilled man, based upon a $1 an hour wage, costs, on the same basis, about $2,875 per year. If the amount of payroll to be saved is multiplied by the number of skilled and unskilled workers that can be eliminated by the introduction of any of the many mechanical devices which can be introduced, and the total compared with the cost of such equipment, it will often be found that its installation can be paid for within one to three years. The net results that follow are lower costs, increased production and resulting increase in profits.

Mechanical equipment of value to foundries, large or small, should reduce the number of workmen required and enable the production of better castings. A number of possible installations follows:

1. Unloading and conveying equipment for pig iron, scrap, coke, sand and all other bulk commodities.
2. Preparation of charge for cupolas or furnaces and mechanical charging of same.
3. Arrangement for pouring metal in molds, including type and size of ladles and pouring system.
4. Sand preparation to maintain required grain size, bond, permeability and strength, to meet each foundry's requirements and in some cases the requirements for different classes of work. Also for the economical handling of the sand to molding stations.
5. In dry sand work, the proper drying of molds in ovens that meet all requirements as to dehydrating temperature and yet are economical in the use of fuel.
6. In steel foundries where the bulk of the product has to be annealed, properly constructed annealing furnaces with modern methods of charging and firing.
7. Chipping and cleaning of castings to be governed by kind and size of castings made.

Lack of necessary handling facilities is the principal cause of high cost in a foundry. Each foundry's problem is a special one, but whether the buildings and general physical layout are good or poor, handling facilities can be introduced that will increase profits by reducing payroll for manual handling.

In steel foundries, to a greater degree than in iron foundries, the possibility of wasting fuel requires constant watching. Natural gas, fuel oil, coke, producer gas and other fuels, unless properly controlled, may easily cost 25 to 50 per cent more than is necessary. Open-hearth furnaces, drying ovens and annealing furnaces should be regulated closely to make sure that the fuel used is not being wasted and that the temperature most effective for the particular operation is being obtained.

Controlling Costs

Modern cost and accounting methods are necessary to produce the best analytical records and equitable costs. There is no better barometer for locating and remedying high points in the cost of operations than through a properly detailed cost and accounting system. Factors needing attention, which otherwise might never be located, will turn up continuously when these records are reviewed, and increase in profit will follow the correcting of high points in manufacturing costs.

Insofar as steel foundries are concerned, facilities for acquiring cost data are available continuously. With the iron foundries, conditions are not so good. It appears that the best progress has been made so far by attacking this problem among groups of foundries in specific localities. Progressive iron foundrymen should get together in the same manner as has been done by the Electric Steel Founders' group and the Steel Castings Development Bureau. These two distinct groups of steel foundrymen each have organized to improve their products by technical and metallurgical study and they have made very satisfactory progress.

One method of reducing costs is to acquaint foremen with the cost of operating their departments, both with regard to productive costs performed and with the departmental operating costs. The latter comprise such factors as cost of common labor, maintenance cost for supplies used around the foundry and for operating equipment and cranes, repairs to machinery and equipment, needless running of machinery, leaks in compressed air lines, careless piling of castings and miscellaneous equipment, and maintenance of proper gangways. When foremen are furnished with a monthly exhibit of their operating expenses, it awakens a lively appreciation in their minds that is reflected in improved conditions on their

(*Concluded on page* 974)

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Eaton Interests Buy Corrigan, McKinney

Purchase Made by Cleveland-Cliffs Iron Co.—William G. Mather Made President—Merger with Otis Possible

THE Corrigan, McKinney Steel Co., Cleveland, has passed to the control of the Cleveland-Cliffs Iron Co. by the purchase of the stock of Mrs. James Corrigan, widow of the former president of the Corrigan, McKinney company. Mrs. Corrigan owned 53¾ per cent of the stock. The Cleveland-Cliffs company also bought the 8¾ per cent interest held by Mrs. Parthenia Ross, giving it the ownership of 62½ per cent of the total capital stock consisting of 2500 shares.

This purchase is believed to make the way clear for the eventual merger of the Corrigan, McKinney company with the Otis Steel Co., as the Cleveland-Cliffs company owns a substantial interest in the latter. However, control of the Otis company is understood to be in the hands of the Van Sweringen interests, who are apparently friendly with the Mather interests.

W. G. Mather Elected President

Following the purchase, the Corrigan, McKinney company was reorganized, William G. Mather, president of the Cleveland-Cliffs company, was elected president. Mr. Mather is chairman of the board of the Otis Steel Co. In addition, there is now an interlocking of directors, three members of the Cleveland-Cliffs organization who are on the Otis board having been made directors of the Corrigan, McKinney company.

The purchase had no relation to any projects or mergers in the iron and steel industry which are now being discussed or advocated, but was solely for the interests of the Cleveland-Cliffs Iron Co., according to an announcement issued by Mr. Mather.

It is stated that Mrs. Price McKinney, with 30 per cent stock interest, and Mrs. Stevenson Burke, who also owns 7½ per cent, will retain their holdings.

The Cleveland-Cliffs Iron Co. is owned by the Cliffs Corporation, of which Mr. Mather is also president. Fifty per cent of the common stock of the latter is owned by stockholders of the Cleveland-Cliffs Iron Co. and the other 50 per cent by Cyrus S. Eaton and associates.

The Corrigan, McKinney Steel Co.'s plant consists of four blast furnaces, coke ovens, steel plant, with 14 open-hearth furnaces, and two bar mills. In addition, it has extensive deposits of iron ore on the Mesabi, Gogebic and Menominee ranges of the Lake Superior district owned both in fee and under lease. It also owns coal mines in Kentucky.

New Directors Elected

At a meeting of the directors of the Corrigan, McKinney company, March 21, John Watson, Jr., resigned as president and director and three other directors also resigned. William G. Mather was elected president; S. Livingston Mather, vice-president of the Cleveland-Cliffs company, was elected vice-president, and D. T. Croxton, manager of pig iron department of the Cleveland-Cliffs company, was elected secretary. Directors to resign, in addition to Mr. Watson, were J. R. Nutt, president Union Trust Co.; W. M. Baldwin, executive manager Union Trust Co., and Homer H. Johnson, attorney. In their places H. A. Raymond, manager of the ore department of the Cleveland-Cliffs company, E. B. Greene, J. E. Ferris and Andrew Squire were elected. H. T. Harrison, Donald Gillies and J. S. McKesson will continue as vice-presidents in charge of manufacturing, mining and sales respectively and also as members of the board of directors. Edward G. Resch, the present treasurer and secretary, was made treasurer and assistant secretary. It is announced that there will be no other changes in the personnel.

WILLIAM G. MATHER, associate of Cyrus S. Eaton in merging steel companies, has been elected president of the Corrigan, McKinney Steel Co. He is also chairman of the Otis Steel Co. and president of the Cleveland-Cliffs Iron Co., which bought Corrigan, McKinney

Following the acquisition of control of the company, then known as the McKinney Steel Co., by James Corrigan, in 1925, the McKinney Steel Holding Co. was formed to control the majority stock interest in the McKinney Steel Co., and $7,500,000 in preferred stock was issued by that company, this being secured by James Corrigan's common stock holdings. This holding company stock probably will be called.

The merger of the Corrigan, McKinney Co. with the Otis Steel Co., if effected later, will bring about an organization having considerably greater diversity of products than either of the present companies has. The finished steel output of Corrigan, McKinney plant is only in steel bars, but the Otis company manufactures plates, sheets and hot and cold-rolled strip steel. Both companies at present sell pig iron, the sales of the merchant output of the Otis company being handled by the Cleveland-Cliffs Iron Co.

Trade in Waiting Attitude, Say Statisticians

Business at present is in a waiting attitude, despite the lower interest rates and improved credit conditions prevailing, according to the March report of the Conference of Statisticians in Industry, operating under the auspices of the National Industrial Conference Board, New York.

The reluctance on the part of buyers and borrowers to avail themselves of the easier credit conditions evidently is due in part to the influence that the unemployment situation has upon business psychology, as well as upon consumer psychology and purchasing power.

While improved credit conditions and the advancing season normally should stimulate business activity during the next few weeks, it is pointed out that much depends on the realization of the large capital expenditures planned and expected to be made by the railroads, utilities and the Federal, State, county and city governments. That these expenditures cannot be counted upon too definitely in each instance is indicated by the fact that railroad earnings, for instance, for the first quarter of the year will show a considerable decrease from a year ago, and that it is unlikely that appropriations for improvements will be made to an extent greater than warranted by earnings.

Generally low commodity stocks, low interest rates and the spreading of easier credit conditions and the normal stimulant of the approaching spring and summer season are given as the chief favorable factors of the general business situation. In comparing quantitative data expressed in dollar values, of the present and of a year ago, the conference emphasizes, allowance must be made for lower commodity price levels, which produces a shrinkage of business indicators based on values, exceeding the shrinkage in business volume.

Crucible Steel Co. of America and subsidiary companies realized a net profit of $8,162,343 for 1929, after deducting taxes, bond interest and other charges. Earnings were equal to $11.66 per share of common.

Believes Business at Bottom of Broad Valley

BY LEWIS H. HANEY
Director, New York University Bureau of Business Research

FAVORABLE FACTORS

1.—Very low money rates, (1) indicate the possibility that the business cycle has approached bottom levels, and (2) encourage investment

2.—Improvement in the bond market is likely to stimulate building activity within a few months

3.—Construction contracts (floor space) gained in February (chiefly public works and utilities)

4.—Large construction projects by municipalities, utilities, railroads, etc.

5.—Slight upward trend in the unfilled orders of the Steel Corporation through February

6.—Recovery in the stock market improves business sentiment

UNFAVORABLE FACTORS

1.—Commodity prices still weak; Bureau of Labor Statistics February index within ¾ per cent of the post-war low
2.—Declining trend in employment and payrolls continued through February
3.—Foreign trade off sharply; February exports the lowest for the month since 1923
4.—Building permits declined in February and are very low
5.—Automobile production and sales backward
6.—Farm situation hurt by large carry-overs of wheat and cotton and low prices
7.—Car loadings decline to the lowest level in recent years
8.—Rising brokers' loans and total collateral loans, with both high compared with deposits, and bank investments declining
9.—The P-V line declines and is below normal

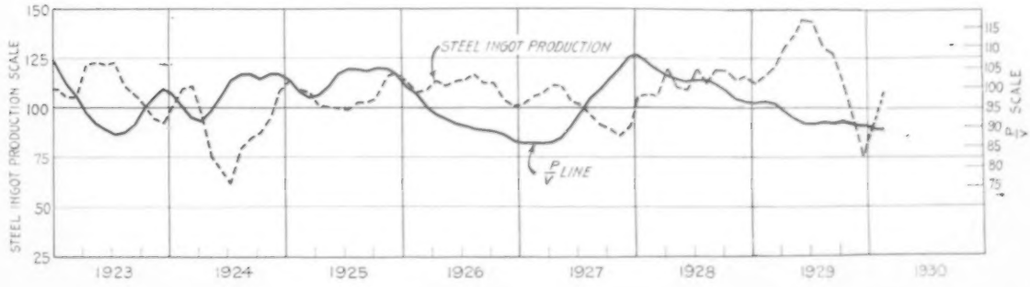
COMMODITY prices have recently shown a little greater strength, there being more advances than declines a week ago. Money rates have touched levels usually found only near the bottom of business recessions. These facts, together with a rising bond market, warrant hopes that stabilization is not far off. While it may be conceded, however, that business has touched bottom (or at least may not decline to much lower levels), there is little basis for expecting the early beginning of a sustained upward trend. The probability is that several months of dull and rather depressed business conditions lie ahead. The valley is likely to be wider than optimists have anticipated.

EVENTUALLY low interest rates will become more general and will stimulate investment. They will facilitate business recovery. Commodity prices will become sufficiently cheap to curtail production and stimulate buying. Supplies will finally lag behind demand. When commodity prices become stabilized and employment ceases to decline, we may expect the beginning of sustained recovery. A rising trend in building activity will doubtless be an important factor. These are the points that are to be watched.

The P-V line (based on the ratio of commodity prices to the physical volume of trade) is down again and is lower than any time since May, 1927. Both the trend and the level of this barometer are believed to be significant. The decline in February indicates a further reduction in buyers' demand schedules,—in the intensity of the demand or the prices that buyers are willing and able to pay.

The level has been below normal for ten months and indicates that the supply of commodities exceeds the demand at current prices. In short, we are in a buyers' market for most commodities. The only way that some prices are maintained is through an artificial refusal on the part of holders to sell except to the more necessitous buyers. This is the general story told by the P-V line.

As to steel, the spurt in January and February production was clearly not justified by general business conditions. Curtailment had run a little too fast and far in December, but the February level was too high to be maintained and a distinct setback is to be expected in the adjusted March index. It may be said, however, that it does not seem likely that further recession in steel production will run as far below our estimate of normal as in 1924. The chart suggests that it will merely fall back toward an annual rate similar to that of last December and share in the dull and semi-depressed condition of general business.



Steel Production May Fall to an Annual Rate About Equivalent to That of Last December

This Issue in Brief

If machining is difficult and the tool requires too much grinding, the student in university heat-treating course is taught how to heat treat to break up the cementite, and anneal for easy machining.—Page 915.

* * *

In galvanizing, the distintegrating action of the zinc on the steel kettle is found to be less at 1000 deg. Fahr. than at 950 deg. The temperature of the zinc should not be permitted to exceed 900 deg. in any part of the pot.—Page 933.

* * *

World's largest porcelain furnace is installed in refrigerator plant. Electric furnace has a capacity of 5000 sq. ft. of steel an hour. Conveyor system operates through the furnace.—Page 928.

* * *

Practical heat-treating instruction is given to budding engineers at Midwestern university. In a completely equipped heat-treating shop, the students learn heat treating, pyrometry, the use of the microscope, primary metallurgy, and test methods.—Page 916.

* * *

In machining locomotive parts the first law is workmanship to erecting form standards, rather than speed. In this way the wastes due to hand fitting and rehandling massive parts are eliminated.—Page 921.

* * *

Considerable savings can be made in foundry costs by re-treating used molding sands. It is possible to reduce consumption of new sand as much as 80 to 90 per cent. Systematic effort to standardize and retrieve molding sands will reduce the quantity of defective castings.—Page 937.

* * *

Is corrosion cracking in alpha brass accentuated by lead and tin? Yes, says Morris of Bridgeport Brass. No, say others. Lead, says one metallurgist, is innocuous as to season cracking, but promotes "fire cracking."—Page 932.

Season cracking in brass tube indicates improper mill procedure, says metallurgist. Declares that practically any size of brass tube can be drawn to any commercial degree of hardness without cracking and without annealing.—Page 932.

* * *

Watch the violence of the boil carefully, in making duplex steel. If, toward the end of the heat, the carbon is dropping rapidly, more pig iron should be added. A heat tapped when carbon has been allowed to run extremely low will be wild, and indicates very poor practice.—Page 926.

* * *

Die castings with zinc base should be made with zinc containing only 0.01 to 0.02 per cent of impurities, to insure maximum permanence, die casting committee of A.S.T.M. demonstrates.—Page 939.

* * *

To get foundry costs down, the foundry foremen should collaborate with pattern shop foremen in order to decide on the best method of making patterns to meet foundry floor practice. In plants operating foundry departments, it is well to assign certain engineers to shop work for periods that will be sufficient to acquaint them with actual operating methods.—Page 937.

* * *

Refrigerators are made completely on moving conveyor. No trucking, no moving by hand. Cabinets are assembled, finished, minutely inspected, crated and conveyed to warehouse, ready for shipment, without once being removed from traveling production line.—Page 928.

* * *

If you want to cut your costs acquaint foremen with the cost of operating their departments, both with regard to productive work performed and with departmental operating costs. This awakens in their minds a lively appreciation of economical operation that is reflected in reduced expenses.—Page 937.

Price cutting and inaccurate cost data usually go hand in hand. Average price basis, without any relation to weight, molding, core-making and other factors, is a poor method of quoting on castings.—Page 974.

* * *

Several months of dull and rather depressed business conditions lie ahead, Dr. Haney believes. Business has touched bottom, but the valley is likely to be wider than optimists have anticipated.—Page 941.

* * *

Foundry coke consumption is lower if coke is fast-burning. Coke supplied to General Motors foundries is tested for rapidity of temperature rise. A coke having a burning rate, during test, of 2 to 2.5 min. for a 250 deg. Fahr. rise and a total rise of 280 to 300 deg. Fahr., will melt iron faster and heat it to 2700 deg. Fahr. with a smaller coke consumption than will a coke having a lower burning rate.—Page 930.

* * *

Even rust-resisting steels need to be washed occasionally to avoid corrosion. Otherwise they will be gradually affected by the sulphates and chlorides in deposits of soot.—Page 931.

* * *

If the sheet fails during drawing, was the sheet at fault or are the dies to be blamed? Hitherto it has been impossible to answer this question, but now Packard can determine by the Rockwell hardness test and the Erichsen test whether the sheet steel will work satisfactorily in any given die. The Erichsen test indicates the depth of draw that a sheet will stand, as well as the character of its surface after drawing.—Page 931.

* * *

Foundry that is not posted on alloy metals is losing business, says engineer. Market restriction results from inability to furnish the high-grade product now required by contractors and engineers.—Page 936.

Mechanical Lapping a Rapid Process

Machines With Either Abrasive Lapping Wheels or Cast Iron Plates for Laps Now Available for Production Work

MECHANICAL lapping of cylindrical and flat surfaces, with data on the construction, operation and output of three machines designed for such work, was interestingly discussed by Sidney Player, Norton Co., Worcester, Mass., at a meeting of the Metropolitan and Plainfield sections of the American Society of Mechanical Engineers, held at the Down Town Club, Newark, N. J., on the evening of March 20. The meeting was under the auspices of the society's machine shop practice division.

W. J. Peets, engineer in charge of factory methods, Singer Mfg. Co., Elizabethport, N. J., presided. An unscheduled but noteworthy part of the meeting was the participation of Major W. E. Hoke, consulting engineer, New York, who during the War developed what has become known as the Hoke method of mechanical lapping flat surfaces, used by the Pratt & Whitney Co., in making precision gage blocks.

Mr. Player described three mechanical lapping machines, all of vertical type and built by the Norton Co. Two of them, for cylindrical and flat work, respectively, uses cast iron plates for laps, while the third machine, a later development, employs a pair of abrasive lapping wheels.

The lapping machine for flat surfaces and that for cylindrical pieces are similar in design except for the workholder drive. The workholder, or cage, mechanism is arranged to impart a motion to the work similar to that used by a toolmaker in hand lapping. Some of the various workholders used on the machines, including those of the "leg spider" type, were described and illustrated, as well as the method of preparing new laps and performing subsequent dressing operations.

From 30 to 40 1-In. Cylinders Lapped Simultaneously

Steel cylinders 3 in. long, 1 in. in diameter and having a ½-in. hole through them, were used by Mr. Player to illustrate the steps in the lapping operation. These cylinders are first ground to a limit of plus 0.0002 to 0.0004 in., and then lapped to a finished size of 1 in., plus 0.0001 in. and minus nothing. Operation is as follows: The cylinders are loaded on the workholder of the machine and placed between the lapping plates. A small amount of fine abrasive, consisting of dust fines, aluminous oxide abrasives, mixed with kerosene and lard oil is then applied with a brush, and the machine started.

"Between 30 and 40 cylinders are lapped at one time," said Mr. Player. "After running the machine for a few minutes, one cylinder is taken off and measured. Having been careful to take the time necessary to bring the first load down to size, by giving all subsequent loads the same amount of time, load after load will be the same size or easily within the specified limit, providing the grinding is held to the limits noted above. The same procedure is followed in lapping flat disks, within the above limits."

Average production of such cylinders was said to be about 60 to 70 an hour. A good commercial finish is produced.

For precision lapping to very close tolerances, two operations, roughing and finishing, are required. This process was illustrated in the lapping of 30 0.875-in. diameter plug gages to limits of plus or minus 0.00002 in. In this case, grinding is held to plus 0.00015 to 0.00030 in. For the complete lapping of these 30 gages to the limits specified, the time taken would be from 2 to 3 hr.; the roughing taking only 30 min. The same procedure is followed for the lapping of precision size blocks.

Machines Using Abrasive Bonded Wheels for Laps

Production from the machines using abrasive bonded wheels for laps, developed in 1928, was said to be very large. These machines are much heavier than those described above and differ also in that the upper and lower abrasive wheels revolve in a different direction. The break-up mechanism, the workholder, or cages, are the same as in the previous machines. A diamond wheel-dresser is provided so that both abrasive wheels can be dressed in a true plane. The wheels are 24 in. in diameter, 3 in. thick, and have a 14-in. hole. This gives the wheel face of 5-in. and enables lapping work up to 5 in. in length.

For rough lapping, silicon-carbide abrasive or vitrified aluminum-oxide abrasive lapping wheels are used, while for finishing, very fine flour grain, silicon-carbide shellac bonded wheels give good results. Coolant consisting of soap and water is pumped to the work and wheels from a large tank placed beside the machine.

It is claimed that 500 piston pins per hour can be easily maintained to limits of 0.0001 in. for straightness and roundness. Stock removal for roughing is 0.0002 to 0.0004 in.; for finishing it is zero to 0.0002 in. of the high limit of the finished piece.

Bonded Abrasive Wheels Eliminate Cleaning Operation

An advantage in the use of the bonded abrasive wheels is that no cleaning operation is necessary, as when loose abrasive is employed. Soft metals may be lapped successfully, and it is claimed that by using bonded abrasive wheels for laps no "charging" takes place, as in lapping soft materials with cast-iron laps and loose abrasives. Several of these machines are now employed for lapping airplane motor wrist-pins. These pins are comparatively soft and when lapped by this method a bright mirror surface results; when using loose abrasive in cast-iron laps the finish is dull gray.

It was pointed out that although bonded abrasive wheels are used, this lapping operation should not be confused with grinding as it is known today. The face of the wheel, not the periphery, is used. It was stated that no feed lines, no traverse marks, nor corkscrew effect are shown, but lines that are criss-crossed, giving that velvety "matt" surface characteristic of genuine lapping.

Advantages of Machine-Lapped Surface

Some of the advantages of lapping as set forth by Mr. Player are: "A machine-lapped surface coming in contact with another moving part reduces friction to a minimum. It provides more thorough and uniform distribution of the oil film surrounding the part. Consequently machine-lapped working parts, particularly those under great stress will wear longer without reduction in size and there will be less risk of seizure, less noise and longer life.

"In the same way such parts as plug gages and gage blocks have a considerably longer life when lapped. This has been substantiated by statistics compiled by manufacturers who have made a study of gage life.

"When machine-lapped parts are used in mass production it is seldom necessary to have selective assembly. By this is meant that with the very close limits to which machine lapping is held, it is not necessary to separate into groups of oversize or under limits so that they may be chosen to fit a corresponding part that may be over or undersize in itself. Machine lapping eliminates a great deal, or all, of this selection of parts and its corresponding loss of production time."

Chipping Square Billets by Machine

Operation Is 10 to 40 Times Quicker Than by Hand and Is Under Depth and Area Control

PRACTICALLY every billet rolled contains small surface defects—seams, broken surfaces and scratches—originating in pouring and cooling the ingot, or caused by the rolls or guides of the mills. To remove them by hand with the aid of a pneumatic chipping hammer often takes hours.

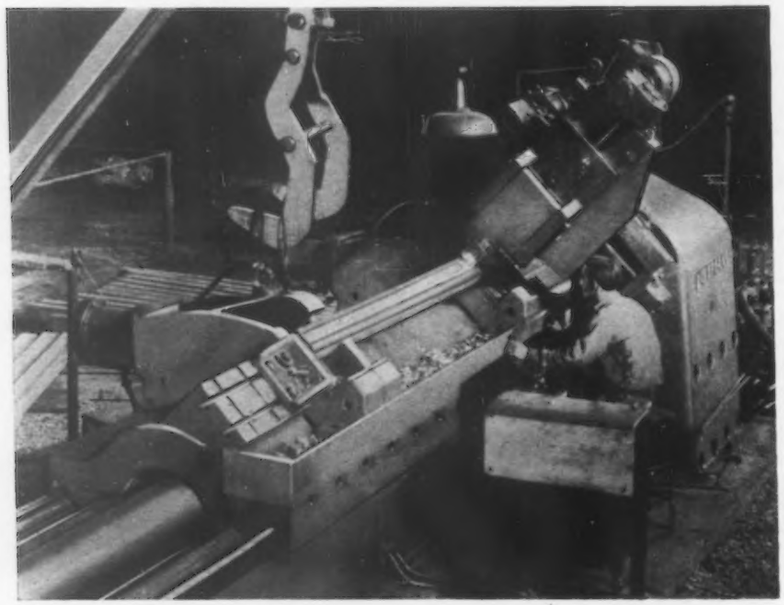
Many attempts have been made to do this cleaning work by machine. A partial solution was reached by Putnam Machine Works when it came out a year ago with a machine called a "billet peeler." This machine, however, was designed for round billets only. It operates on the following principle:

The round billet is clamped by hydraulic device and then pushed through a revolving head provided with multiple high-speed cutters. A second hydraulically operated clamp clips the billet as it passes through the cutting head and pulls it out completely peeled. Machines now in operation take care of billets 8¼ in. in diameter and, with a cut ⅛ in. deep, trim them down to 8 in. in diameter. This is done at the rate of 1½ miles of cleaned billets in 24 hr.

Attempts to solve the problem of square billets have been hampered by two factors: 1. Billets are rarely straight, consequently the usual planer-type machine, making a straight cut, will remove too much material in some places and not enough in others. 2. With milling-type cutters the table speeds are only a few inches a minute.

A new machine, called the "billet gouger," put in a plant in the Pittsburgh district, was developed by the Putnam Machine Works. This machine is of the planer type and has recently done work on billets up to 6 in. square, in lengths up to 10 ft.

The cardinal feature of this machine is unusual sensitivity and ease of control, which permits the cutting tool to follow the camber as well as any crack in the billet in any direction, almost with the same ease as if the cutting tool were in the operator's hand. By providing him with perfect control of the position of the cutting tool, the depth of cut is made a matter of the operator's judgment at all times, and is unaffected by the camber of the billet.



Two Rapid Motions—Sidewise of the Billet and for Depth of Cut—Feature This Unit. Each has its own motor, as shown, mounted on the head

Accompanying illustrations will make the details of operation clear. The billet is clamped on a table actuated by hydraulic drive, and working from left to right. This table can be operated at any cutting speed up to 30 ft. a minute, with a return speed of 50 ft. a minute. The table travel is controlled by a "walking beam" treadle under the operator's feet. The treadle operates an air valve which controls the hydraulic valve of the drive.

Both hands are free to control the cutting tool into or across the billet. A separate device turns the billets 90 deg., to set a new face in position for planing. The cutting tool is held in a massive head, and is quickly responsive to movements in two directions at right angles to each other: in and out of the cut, and across the face of the billet.

These movements are effected through the two controller handles in front of the operator's seat, the controllers operating motors mounted on the tool head. Each motor is 3-hp., 1200-r.p.m., constant-speed, high-torque traverse type.

This machine approximates as nearly as possible the actual operation of hand chipping with pneumatic chisel. For that reason it successfully cleans the billet without removing too much material. Its real advantage lies in the speed with which the work is done. On recent tests it has planed, all over, 6 x 6-in. x 10-ft. 6-in. billets in 12 min., including time required to set the billet in the machine, and to remove it after planing.

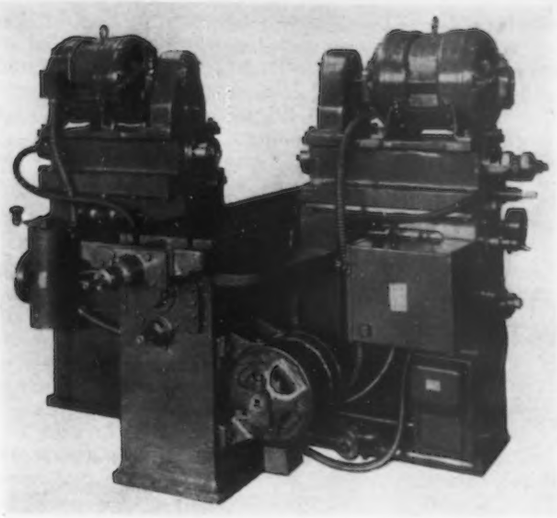
Lubrication of the table ways is of the forced feed type, with oil tank cast in the bed of the machine and a separate motor and oil pump. The remainder of the machine is lubricated by a pressure grease system. The billet gouger is manufactured by the Putnam Machine Works (division of Manning, Maxwell & Moore, Inc.), Fitchburg, Mass.

Welding Rod for 100,000-Lb. Joints

A WELDING rod for making joints of extra strength and ductility has been developed by the Union Carbide & Carbon Research Laboratories, and is now being marketed by the Oxweld Acetylene Co., New York, under the name of Oxweld No. 22 S. D. steel welding rod. It has been developed especially to meet the demand for 100 per cent joints in steel pipe having a carbon content of 0.30 to 0.40 per cent, which has recently come into use. In general appearance, weldability, chemical and physical properties No. 22 S. D. rod is similar to Oxweld No. 1 high test rod, but it will produce welds of even higher tensile strength. Several coupons cut from high-strength alloy plate that had been welded with a single-vee weld showed tensile strengths of 100,000 lb. per sq. in.

Welders accustomed to the use of No. 1 high test rod will experience no difficulty with No. 22 S. D. welding rod. It is a self-fluxing and deoxidizing rod which sparks very little; it forms a fusible slag that rises to the surface where it serves as a protective coating which, although extremely thin, protects the surface of the molten bath from the oxygen of the air and thus prevents oxidation. The composition of this rod also prevents the strengthening element, carbon, from burning out during the welding operation.

Appointment of the E. F. Keating Co., 452 Water Street, New York; Himelblau-Agazim & Co., 30 North Dearborn Street, Chicago, and Stewart Machinery Co., Buder Building, St. Louis, as distributers is announced by Tube-Turns, Inc., Louisville, Ky., maker of seamless drawn, short radius fittings for pipe welding.



THROUGH-SLOTS in 9-In. Diameter Bars, and Single Keyways in 15-In. Diameter Shafts May Be Cut on This Automatic Spline Miller. Table working surface is 14 x 66 in., and table travel is 24 in.

Automatic Spline Miller for Large Work

CUTTING of through-slots in bars up to 9 in. in diameter, and single keyways in shafts up to 15 in. in diameter, are within the capacity of the heavy-duty automatic spline milling machine illustrated, which has been brought out by William K. Stamets, Jenkins Arcade Building, Pittsburgh.

The maximum and minimum distance between spindle ends is 26 in. and 4 in. respectively, while the maximum total spindle infeed is 5 in. The distance from spindle center to table is 8 in. The table has working surface of 14 in. x 66 in.; its travel is regularly 24 in., but longer table travel can be furnished when specified. Speeds range from 4 to 20 in. per min.

Spindles are mounted in precision roller bearings. Each spindle is driven by a separate 2-hp. motor, and four spindle speeds are obtainable. Depth of cut is set by means of scale and vernier, and an automatic electric control serves to stop the feeds when the predetermined depth is reached. The table is driven by a screw, direct connected through silent chain and speed variator to a 2-hp., 750-r.p.m. motor. Length of table stroke is controlled by setting a positive stop on the screw shaft dial plate; this stops the table at the same place at each end of each stroke. Table reverse is obtained by reversing the table motor immediately after the table stops. A dwell at the end of the stroke for infeed of the cutter permits a deeper infeed than is practical where the infeed occurs toward the end of the stroke.

Exceptionally Large Crank Press Is Built

WHAT is believed to be the largest crank press which has ever been built has been completed by the Toledo Machine & Tool Co., Toledo, Ohio. An idea of its magnitude may be had from the fact that the crown weighs about 130,000 lb., the slide about 130,000 lb., the bed complete about 300,000 lb., and the total press weighs about 800,000 lb.

The two steel gears on the crankshaft are 140 in. in diameter, with an 18-in. face. The bed is 288 in. right to left by 68 in. front to back. The pressure exerted at the bottom of the stroke is 3,500,000 lb., with a comparatively small amount of deflection.

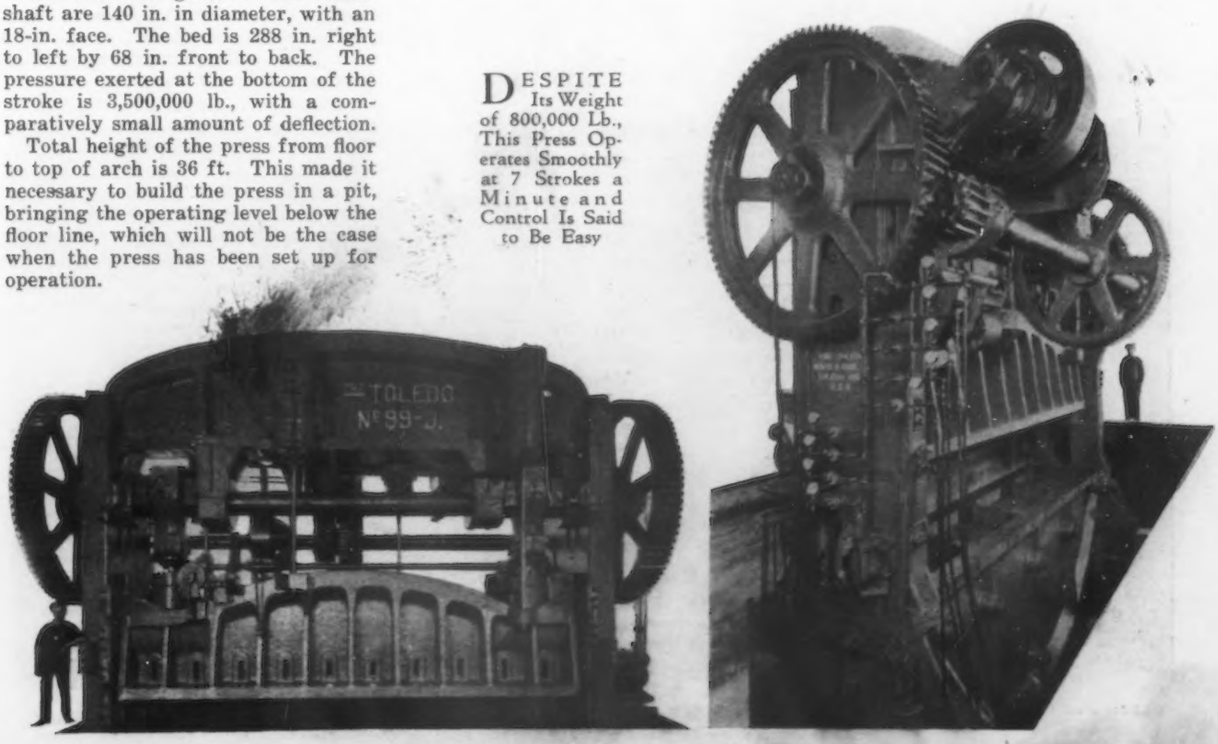
Total height of the press from floor to top of arch is 36 ft. This made it necessary to build the press in a pit, bringing the operating level below the floor line, which will not be the case when the press has been set up for operation.

Accompanying illustrations give a good idea of the mammoth proportions of this press. Scale on the front view of the upper part is afforded by the man. The rear view shows the press in its entirety, with the driving mechanism.

Notwithstanding the great weight of the moving parts, the slide has been carefully counterbalanced by four air cylinders, two of which are at the front and two at the back of the press. These counterbalances insure smooth running of the slide, which operates at seven strokes a minute.

Control is by the Toledo patented improved multiple-disk friction clutch, with independent brake, which enables the operator to stop and start the press at any part of the stroke. The flywheel is mounted on Timken

DESPITE Its Weight of 800,000 Lb., This Press Operates Smoothly at 7 Strokes a Minute and Control Is Said to Be Easy



roller bearings and is the only part in motion when the press is not in operation. An air-controlled valve operating the clutch mechanism moves so easily that a three-year-old child could operate it. A hand lever mechanically operated is used for emergency, and for setting dies with the control handle in neutral position.

A 150-hp. motor mounted on the rear of the right hand upright and belted to the flywheel furnishes the necessary power. This motor may be stopped or started easily. The motor mounted on the front of the press is used for adjusting the slide.

This press is to be used for heavy blanking, forming and piercing operations in the manufacture of extra large truck rails, etc.

Conveyor-Type Enameling Furnace

Electric Unit for Burning Vitreous Enamel on Steel Sheets Is Employed in a Stove Works

USE of continuous conveyor-type electric furnaces for burning vitreous enamel on steel recently has been extended to the stove manufacturing industry. A short time ago a continuous electric furnace was installed in an Ohio enameling plant for fusing the enamel to kitchenware. A furnace of the same type (General Electric Co.) for burning the porcelain coating on stove parts has been installed by the Estate Stove Co., Hamilton Ohio.

After being dipped or sprayed, depending on whether the ground coat or succeeding coats are being applied, the pieces are placed on a conveyor which carries them through a drying oven and on to the loading end of the electric furnace. After burning, the pieces are put back on another conveyor at the other side of the furnace.

Furnace Designed to Conserve Heat

This is a raised-end air-sealed furnace. With a raised and closed firing end, air circulation is restricted and heat is conserved. The work makes a circuit and comes out at the loading end.

The furnace has a rated capacity of 300-kw. connected load. It is 56 ft. long and is divided into three zones. First there is a heat-exchange zone 15 ft. long. Next comes a preheating section 25 ft. long in a slanting position. Back of that on a horizontal plane is a U-shaped firing chamber 10 ft. long on each side, the bottom of the U being a 4½-ft. diameter circle.

A central wall extends partly through the heating zone. The other two sections are in the form of a continuous tunnel. Heat from the outgoing work, after leaving the heating zone, is absorbed by the incoming pieces as they pass through the heat-exchange and preheating zone.

The conveyor extends 30 ft. beyond the furnace entrance, providing space for loading and unloading, which is done with the conveyor in motion. Work is carried on 16 x 42-in. racks, being hung on the racks on hooks. The racks, of heat-resisting alloy steel, are made of four parallel, straight members connected and braced with cross members. The racks are suspended from a chain-type conveyor on a rod. They will handle pieces up to 24 in. wide and 42 in. long.

The conveyor is carried in a practically airtight housing built of channel and plate sections. The front section of the furnace is raised a sufficient distance from the floor to bring the conveyor at a convenient height for loading.

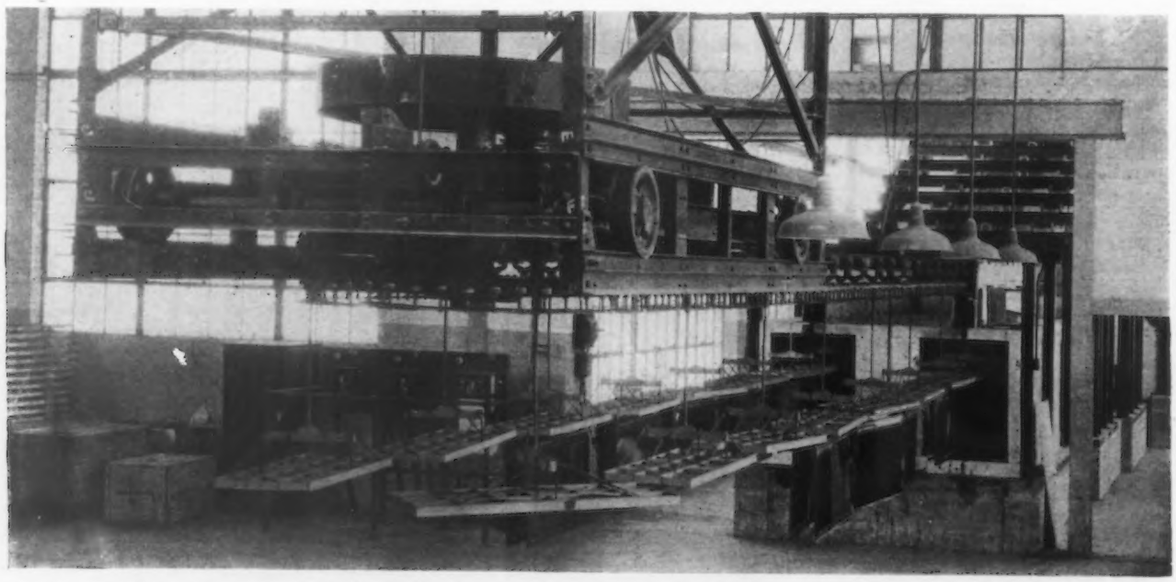
As the driving sprocket for the conveyor is arranged on a counterweighted carriage, constant tension is kept on the conveyor, changes in expansion being taken up by the counterweight balance. If a jam should occur in the furnace, the pull on the counterweighted carriage will cause a limit switch to be operated. This shuts off the motor which drives the conveyor and prevents injury to the conveying system and furnace.

The firing load of the furnace is at the rate of 1500 sq. ft. in an average hour. The work travels at a speed ranging from 6 ft. to 11 ft. a minute.

Close Control of Power and Heat

Power is fed to the furnace through three power control panels, each actuated by a separate control instrument. One instrument controls the temperature along the length of the furnace, one controls over the height from top to bottom and the third controls the final temperature of work leaving the furnace. The third control panel is provided with a recording instrument. The temperature-control instruments are along the wall near the loading end of the furnace. The power panels are under the raised end.

Close temperature control, slow heating and cooling, having an annealing effect on the metal and preventing strains and avoiding shocks caused by rapid cooling, are among advantages claimed for this type of furnace. These combined advantages tend to produce work of high quality. The porcelain enamel pieces, it is stated, come out of the furnace with a very smooth coating and a high gloss.



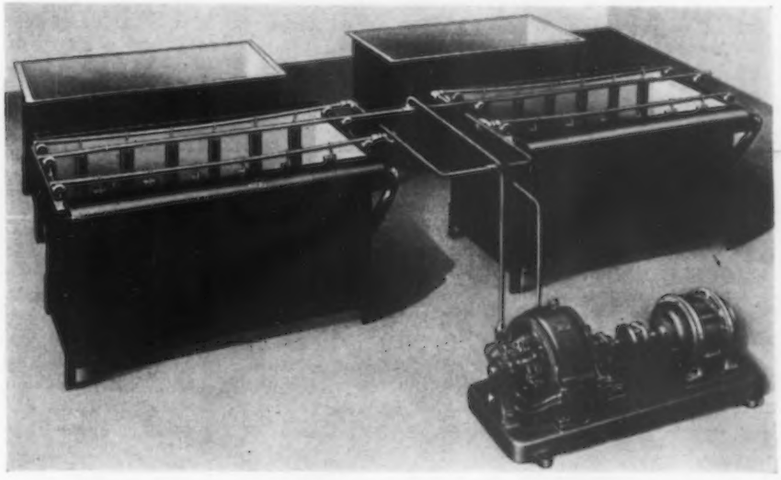
Loading and Unloading End of the Furnace (Unloading at Right). Temperature-control instruments appear on the wall, beneath the counterweighted carriage of the take-up mechanism

Cleans Metals Electrochemically

New Process Removes Scale and Oxides and Cleans Recessed Surfaces—Reveals Material Defects

COMPLETE removal of scale and oxides from the surface of metals, without pitting, etching or hydrogen embrittlement, is claimed for the Bullard-Dunn electrochemical cleaning process recently announced by the Bullard Co., Bridgeport, Conn.

The process is also said to produce a surface that is resistant to corrosion and one that is ideal for subsequent electrodeposition of nickel, copper, chromium and other metals. An outstanding feature is its ability to enter and thoroughly clean recessed surfaces inaccessible to other cleaning methods.



The Metal Surface Is Cleaned by the Action of Hydrogen Electrically Generated at the Cathode in an Aqueous Solution. Equipment for the Bullard-Dunn process includes a source of low-voltage direct current, and a tank or tanks with steam, water and electrical connections

In this process, the metal surface is cleaned by the action of hydrogen electrically liberated at the cathode in an aqueous solution. The surface is cleaned and is simultaneously protected from pitting, etching and hydrogen embrittlement by the deposit of a homogeneous metal coating thereon. Scale, oxides and foreign matter only are removed, it being impossible for the action of the process to attack the original metal, regardless of the time of immersion.

This cleaning method has been used at the Bullard plant for several years, and recently has been installed in the plants of several licensees. It was originally developed for cleaning formed and hardened spring steel automobile bumper bars which are subsequently polished and plated. For this it proved an economical precleaning agent; by completely removing the hard abrasive oxide and scale, it saved considerable time and labor in the subsequent polishing operations and increased the life of the wheels used. It is stated that the cleaning treatment also resulted in a greatly improved quality of electro plates, which were found to be practically impervious to the corrosive attack of the "salt spray" test of the Bureau of Standards.

Large Quantities of Forgings and Heat-Treated Parts Cleaned

Later, the process was applied to the cleaning of forgings and heat-treated alloy steel parts entering into Bullard vertical turret lathes and Mult-Au-Matics, with large savings and improvement in the quality of the finished pieces. All such parts are now thoroughly cleaned by two men, whereas formerly from 20 to 25 men were necessary in sand blasting, scratch brushing, filing, rubbing with emery cloth and retapping of threaded holes.

The Bullard-Dunn process results in preserving the original contour and dimensions of accurately machined parts such as gear teeth, splined shafts, keyways, screws and nuts. It also brings into prominence, original defects in material, such as pipes and seams in bar stock and "ruptures" in forgings, also hardening cracks, which, in being easily detected, permit of rejections before further processing. Savings have also been found in the time required for subsequent operations, such as internal and external grinding, and in the cost of wheels employed for this work. Production of assembled units has been expedited as a result of the clean work produced.

Pieces ranging from small screws and nuts to large hardened gears, shafts and forgings may be cleaned by this process; also small tools, and parts to be electroplated. The process is offered to drop forgers for improving the quality of their product through the thorough removal of scale and the other features noted above.

If the forgings are descaled before trimming, savings are possible through increased life of trimming dies; if they are to be machined, the descaling facilitates machining and reduces tool costs. Likewise, in the metal stamping industry there are said to be many opportunities for saving, particularly in deep drawing operations.

Quality of Electroplating Improved

As a preliminary to electroplating operations the process has proved of value. Several different solutions have been developed to render it effective in descaling and cleaning ferrous and non-ferrous metals. The quality of electroplating is said to be improved because, as an incidental part of the process, there is deposited on the clean surface, including all recesses and depressions, a homogeneous metal coating which forms an ideal surface for subsequent electro deposition of metals. It is further claimed that electrolytically deposited metal surfaces are improved in the resistance to subsequent breakdown and corrosion; also that costs are greatly reduced by the elimination and rejection usually resulting from the plating of uncleaned and electrically inactive surfaces.

In the fabrication of stainless or rustless steel the generation of chromic oxides, which are exceptionally abrasive, is the result of each annealing operation. This oxide is particularly destructive to dies, and adds materially to the time required in subsequent polishing operations. In assuring complete removal of this oxide, use of the Bullard-Dunn process is said to increase the life of the tools, increase production in the polishing department and reduce the cost of wheel renewals.

It is pointed out that small particles of chromic oxide in the finish-polished surface of a product are susceptible to atmospheric corrosion and form foci around which the general surface corrosion rapidly gathers. These "rolled in" inclusions are not always visible and although apparently polished out, they have frequently resulted in ultimate rejection of the finished product. Such inclusions are said to be entirely removed by the process described.

Equipment used with the Bullard-Dunn process comprises a source of low voltage direct electric current; a tank or series of tanks or cells furnished with steam, water and electrical connections; and a ventilating system for the removal of gases and fumes. These gases are not noxious nor detrimental to health, but good ventilation adds to the comfort of the operator.

It is the purpose of the Bullard Co. to extend the use of the process on the basis of a license charge and royalty fee.

Sheet & Tube Directors Again Confer

Proposed Merger with Bethlehem Discussed at Length—Both Sides in Contest Waging Spirited Fight

YOUNGSTOWN, March 25.—Directors of the Youngstown Sheet & Tube Co. today held a lengthy meeting, discussing developments in the plan to sell the company to the Bethlehem Steel Corporation. At adjournment, Roy Welch, secretary to James A. Campbell, chairman of the board, stated that no announcement would be given out concerning developments.

Sheet & Tube directors discussed the proposed sale in detail. Those present at the meeting were Mr. Campbell, Frank Purnell, T. J. Bray, John Tod, Richard Garlick, John W. Ford, all of Youngstown, and H. G. Dalton and Harris Creech, Cleveland.

Charles M. Schwab, chairman, and Eugene G. Grace, president, of the Bethlehem Steel Corporation, are scheduled to arrive in Youngstown Wednesday morning to address directors of the Chamber of Commerce at a luncheon at noon.

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THE merger fight over the Youngstown Sheet & Tube Company has become a battle of words as well as a contest for proxies. In the past week statements and answers and more statements have come from both sides in the controversy, which comes to an issue with the stockholders' meeting on April 8.

Youngstown civic interest in the project was reflected in the vote of the city council Monday night. Only one member opposed the resolution condemning the sale to the Bethlehem Steel Corporation while one member refrained from voting because his son is an employee of the Sheet & Tube company.

Despite the fact that they have taken opposing sides in the merger project, Samuel Mather and William G. Mather sailed together on a trip abroad. Before leaving Samuel Mather issued a statement in which he said he was 100 per cent in favor of the merger. At the same time it was announced that the Youngstown stock held by the Cliffs Corporation, in which William G. Mather is heavily interested, would not be voted, but this is equivalent to a negative action, as the side favoring the merger must secure an affirmative vote of two-thirds of the 1,200,000 shares outstanding.

James A. Campbell, chairman of the board of Sheet & Tube, issued a statement in which he cleared up uncertainties as to the way the directors voted on the merger proposal. He said that seven of the nine directors who were present voted. The vote stood six to one in favor of it. The one director who voted negatively, Mr. Campbell said, explained that he did so because he regarded himself as representing the Eaton interests on the board. One director did not vote because he is also a director of the Bethlehem Steel Corporation.

"The so-called divided board of directors," said Mr. Campbell's statement, "can be said, therefore, to have been divided not with regard to the interest of Youngstown stockholders as a whole, but as divided by special regard to the wishes of Mr. Eaton himself."

Frank Purnell, president of Sheet & Tube, answered the 14 questions propounded by Myron C. Wick, Jr., secretary of the opposing proxy committee.

In this answer, Mr. Purnell said that the stockholders vote, scheduled for April 8, was not "rushed," but it was the judgment of the directors that prolonged uncertainty in a matter of the kind is injurious to an organization. He said that present market quotations on the securities of the two companies are temporary, and that due weight should be given to the past earning power of the two corporations, with emphasis on present financial strength and present and probable future earnings based on existing conditions.

He asserted that the Youngstown board believed that its shareholders would be more secure with respect to dividends through a merger with Bethlehem than otherwise. The figures show, he said, that last year Bethlehem earned $15.50 a share on the average number of shares outstanding, while the earnings realized by Sheet & Tube on a comparable basis were $17.28 per share. Based on 1929 earnings, Mr. Purnell argued that Sheet & Tube stock is worth $111 a share as against $100 for Bethlehem, whereas the holders of Sheet & Tube stock are being offered an exchange in the ratio of 133⅓ to 100.

The proposed merger, he said, is based upon a careful study of the future situation. He added that the officers of the Sheet & Tube company have frequently called the attention of stockholders to the difficulties under which the company is placed because of lack of diversification of product and by the freight rate structure on both incoming and outgoing shipments.

Declaring that there had been no "feverish haste" in the acceptance of the Bethlehem proposal, Mr. Purnell said that the subject had been under consideration for a long time.

Youngstown shareholders have been bombarded with facts and figures, including the annual report for 1929 of the Bethlehem Steel Corporation, about which Mr. Campbell wrote:

"I commend to your very careful consideration this remarkably strong report of Bethlehem as showing not merely the company's strength in 1929, but how that strength has been built up and fortified by a policy of careful, conservative and aggressive management."

Cyrus S. Eaton, who ordinarily has assumed a silent rôle in merger negotiations, has jumped into the thick of the fight. Not only has he made frequent trips to Youngstown to assist in persuading stockholders to vote against the project, but he has issued several statements in which he has discussed past and possible future developments with candor.

In one statement he said:

"I am the largest individual investor in Youngstown enterprises. Not only have I large holdings of Sheet & Tube and Republic stock, but I am also financially interested in

(*Concluded on page* 965)

COMING MEETINGS

APRIL

Concrete Reinforcing Steel Institute. March 31 and April 1. Sixth annual meeting, Hotel Bon Air-Vanderbilt, Augusta, Ga. M. A. Beeman, 2112 Tribune Tower, Chicago, secretary.

American Society of Mechanical Engineers. April 5 to 9. Fiftieth anniversary celebration, Chamber of Commerce Building, Washington. Calvin W. Rice, 29 West Thirty-ninth Street, New York, secretary.

American Oil Burner Association. April 8. Seventh annual convention, Stevens Hotel, Chicago. H. F. Tapp, 342 Madison Avenue, New York, executive secretary.

American Zinc Institute. April 14 to 16. Annual meeting, Statler Hotel, St. Louis. Julian D. Conover, 60 East Forty-second Street, New York, secretary.

National Metal Trades Association. April 16 and 17. Annual meeting, Hotel Astor, New York. J. E. Nyhan, Peoples Gas Building, Chicago, secretary.

American Welding Society. April 23 to 25. Annual meeting, Engineering Societies Building, New York. M. M. Kelly, 33 West Thirty-ninth Street, New York, secretary.

Chamber of Commerce of the United States. April 28 to May 1. Eighteenth annual meeting, Chamber of Commerce Building, Washington. D. A. Skinner, Chamber of Commerce Building, Washington, secretary.

Sound Ingots and Castings

British Institute of Metals Takes This as Topic for Principal Discussions

Special Correspondence

LONDON, ENGLAND, March 14.—Several noteworthy developments in society affairs were published at the annual meeting of the Institute of Metals which adjourned yesterday. Perhaps the greatest interest concerns the visit of the Institute to America. A draft itinerary has been prepared in consultation with the Iron and Steel Institute, the members of which will be visiting America at the same time. The present proposal is to leave England for New York early in September, 1932, returning from Montreal, Canada, about the end of that month.

Professor Ros, of Zurich, conveyed to the meeting the greetings of l'Association Suisse pour l'Essai des Materiaux (Swiss Association for Testing Materials), and, in the name of the Association, invited the Institute to hold its 1931 autumn meeting at Zurich. The International Association for Testing Materials intends to hold a congress at Zurich in September, 1931, and the engineers and metallurgists of that city would be glad to welcome the members of the Institute of Metals in that same year. This invitation was accepted.

International Metallurgical Research

The annual report of Council stated that one outcome of the successful meeting of the Institute in Germany last autumn was the suggestion that closer international cooperation was desirable, particularly regarding metallurgical research. This suggestion was warmly taken up by the French and German members of the Institute present at Düsseldorf and, as a result, a preliminary conference was held in London, under the chairmanship of Dr. Walter Rosenhain, for the purpose of discussing the possibility of forming an international metallurgical research organization which should secure closer cooperation in the future. For the present this movement was designed to provide means for keeping those engaged on nonferrous metal research in the various countries informed as to what was going on in other countries, and so to prevent unnecessary overlapping and the irritation sometimes caused when work done in one country was apparently ignored by the scientists of another.

Dr. R. Seligman, the president-elect, also touched upon this matter in his address, wherein he dealt mainly with the new obligations imposed upon the Institute of Metals by the fact that in the space of twenty years it had developed from a small body of English enthusiasts into an international institution with a membership spread all over the civilized world. Dr. Seligman said that it would become necessary to devise means by which the headquarters could be kept in regular touch with the flow of opinion among the distant bodies of the Institute's membership. He thought there were at least a dozen places where groups of from 20 to 30 members could readily foregather, and it is possible to extend the local-section idea to such places, and so to secure regular meetings of the overseas members among themselves. Twenty is not a large number for such a purpose, but it is one of the great advantages of a local section that it welcomed associates, who were frequently young men unable to defray the cost of full membership, but who could with confidence be looked upon as the recruits of future years.

United Engineering Building

Another important development during the past year had been the decision of the Council to participate in the movement for the erection of a joint building for the purpose of housing a number of scientific and technical societies, including the Institution of Mining and Metallurgy, the Iron and Steel Institute, an important group of chemical societies, and the Institute of Metals. Substantial financial contributions had been promised from a number of sources, and it is hoped that the erection of a building might proceed in the near future.

Proposals had also been made during the year for the transfer to the British Non-Ferrous Metals Research Association of the control of the research which had been conducted continuously by the corrosion research committee of the Institute of Metals since 1910. This transfer had finally been effected on Jan. 1, last, and henceforth the work would be controlled, directed and financed by the Research Association.

Gas Content and Soundness

Discussion centered largely upon the problems of pouring ingots and castings so they would be free from gas pockets and unsoundness. In a paper entitled "Experiments on the Influence of Gases on the Soundness of Copper Ingots," N. P. Allen of Birmingham University pointed out that the presence of hydrogen in molten copper can cause serious unsoundness in the ingots cast from it. Unsoundness found in commercial ingots is not due to hydrogen alone, but to hydrogen and cuprous oxide together, which react in the solidifying metal to evolve steam. This phenomenon is very difficult to suppress, so long as cuprous oxide is present in the metal. Mr. Allen concludes that those elements which, when added to copper, endow it with the ability to cast soundly, do so by reducing the cuprous oxide present. Carbon monoxide, carbon dioxide, and nitrogen are inert, so far as the formation of blowholes is concerned.

Messrs. Hanson and Archbutt and Miss Ford have studied the properties of copper containing up to 1.48 per cent of phosphorus, in which the amount of other impurities has been kept as small as practicable. A series of billets of 11 alloys containing from 0.014 to 0.95 per cent phosphorus has been prepared and rolled, and the tests were made principally on rolled material.

Phosphorus was found to remove oxygen from copper and improve its casting and cold working properties. Small amounts of oxygen can be found together with phosphorus in copper, depending on the amount of phosphorus present. Copper containing up to 0.95 to 1.2 per cent phosphorus can be hot-rolled, and up to 0.79 to 0.95 per cent cold-rolled from a cast billet. Phosphorus improves all those mechanical properties of copper which have been studied, and raises the softening temperature of cold-worked material. It is, of course, seriously detrimental to electrical conductivity, which may be attributed to the fact that it is markedly soluble in solid copper. The wrought alloys of higher phosphorus content exhibit a small amount of age-hardening after suitable heat-treatment.

In a study of "Macrostructure of Cast Alloys," R. Genders of the research department, Woolwich arsenal, finds that when an alloy is cast in a mold prepared by a coating of volatile material, the macrostructure of the resulting ingot may be considerably modified by the turbulence resulting from the evolution of gases by the mold coating.

Fabricated Steel Plate Orders Are Low

WASHINGTON, March 25. — Orders for fabricated steel plate in February totaled 27,193 tons, or 34.6 per cent of capacity, according to reports received by the Department of Commerce from 48 firms. This compares with 50,076 tons, or 63.6 per cent of capacity, in January.

February orders were distributed as follows: Oil storage tanks, 7396 tons; refinery materials and equipment, 2961 tons; tank cars, 1928 tons; gas holders, 3643 tons; blast furnaces, 279 tons; stacks and miscellaneous, 10,986 tons.

Except for last December, with only 23,535 tons, the February total was the smallest for any month since 1924. In spite of that fact, however, the tonnage going into gas holders was the largest since last July. That for refinery materials was the heaviest, with one exception, since last October.

A. I. FINDLEY
Editor

THE IRON AGE

W. W. MACON
Managing Editor

ESTABLISHED 1855

Economics, Popular and Otherwise

POPULAR economics as expressed in Congress, in the daily press, and in partisan propaganda is as amazing as the discussions in Alice in Wonderland, and sometimes it is so picturesque as to be equally interesting.

Prohibition:

In the great controversy among the American people in respect to alcoholic drink we are not editorially participating (except insofar as it has been related to entertainment at trade conventions), but while so refraining we may venture the purely scientific statement that there is no statistical evidence that prohibition has increased either the national income or the national saving. It may have done so, and maybe not, but estimates under those heads are necessarily too much generalized to reveal such details.

Unemployment:

Of immediate practical concern is the subject of unemployment, in respect to which reliable statistics are also lacking. However, there are pathetic appeals to Congress to do something to relieve distress. There is nothing that Congress can do to provide jobs for everybody, any more than Mr. MacDonald's government has been able to ameliorate a more chronic and more distressing situation in Great Britain.

Unemployed labor could, on the other hand, do something for itself by consenting to work for lower wages. One of the worst economic fallacies that has been preached to willing ears is that wages must never be reduced, lest scale of living be impaired, and buying power be curtailed, along with other buncombe which has issued even from the mouths of financiers.

No industry is in more trouble than the textile, especially in New England. The great Amoskeag Mfg. Co. recently informed its employees that it could secure a contract that would keep them all busy for six months if they would accept a reduction of wages, but the employees voted four to one that they would not.

In the meanwhile the earnest movement to relieve the textile industry by persuading the women of the world to lengthen their skirts and don more clothing otherwise is clearly not getting very far, as any observer on Broadway will testify.

Women:

It appears that women have been responsible for more basic economic trouble than was previously supposed. According to Prof. James L. Boyle, of Cornell University, the modern feminine desire for slenderness has cut the consumption of bread by 20 per cent and thereby affected adversely the wheat sales of the world. This explains much and furnishes a subject for the attention of the farm bloc in the Senate, which may immediately institute an investigation.

Really there may be something in this thought, and likewise a ray of hope, for we have also read recently that, the designers of Paris having made up their minds that their newest creations ought to adorn figures somewhat more opulent, it was found that none of their mannequins could adequately qualify; wherefore the assistance of physiologists was invoked in order to fatten them. But, alas! their prescription was for more potatoes in the diet, rather than more wheat, and we understand that our American potato growers have been doing very well this year.

Now, we deduce from these reports that the way of the economic reformer is complicated and hard, and we do not believe that the senators are going to trudge through it, without becoming lost, not even if they put a high tariff on wheat. The thought occurs to us, on the other hand, that if the arbiters of Paris have decreed that the women ought to eat more potatoes, and if potato raising already be profitable, our suffering wheat growers might shift to potatoes. We understand also that flax is wanted.

The secret of the success of our most profitable corporations has been in producing what the people want rather than what they don't want.

Wages:

Even if the women have made up their minds to wear only one pound of textile fabric at any one time, it might nevertheless be possible to double the annual sale to them if terms were made attractive.

Of course the Amoskeag workers did not see the thing that way. Unfortunately relatively few workers ever do. Administrators of industry preach to their workers (and correctly) that they are partners, but the workers do not sense it at all.

What the workers can see, however, is the possibility of exaction. So it is that the Alexander Hamilton Institute has just reported that in New York building wages are now 2.38 times the average of 1913 and adds that "while the upward trend of wage rates has been beneficial to labor, it has been a growing deterrent to construction, and the rise in wages during the last year has more than offset a downward tendency in prices of building materials. Steady progress has been made, however, in increasing the output per man by labor-saving machinery, such as electric saws, power hoists and mixers for concrete and mortar, so that the total labor cost has increased at a somewhat slower rate than indicated by the wage rate gain."

This is sound deduction but it does not contribute to the peace of mind of the house owner who is constrained to employ a pair of carpenters for a repair job and observes them in earnest conversation regarding an interesting political question at a cost to himself of 5c. a minute. Engineers have been unable to mechanize repair jobs, and those will be the last refuge of the labor leaders, who are really not so much predatory as they are innocent of economic perception.

Seriously, however, America has not for nearly 40 years been face to face with a real crisis, one in which the national capital has been lost or locked up, when employers and employees alike have been hard-pressed to get their living. We pray that no such thing will happen again. But if it should? Would we escape violence?

The Steel Corporation Report

THE Steel Corporation's balance sheet underwent large changes during 1929, on account of bond retirement, effected partly by issue of common stock, and various adjustments of unusual size. The balance sheet of December 31, 1928, totaled $2,442,030,233, while that of December 31, 1929, totals $2,286,183,655, involving a reduction of $155,846,578.

Bonds carried on the balance sheet decreased by $344,344,435, from $456,602,415 to $112,257,980. The Steel Corporation bonds, first and second, $317,380,000, disappeared entirely except for $8,091,000, made up of some matured and called and some uncallable bonds. By the issue of 1,016,605 shares of common stock, for bond retirement, the common stock capitalization is increased by $101,660,500, while there is carried under reserves and surplus an item of $41,037,124.50, premium on common stock sold.

The book surplus is increased by only $24,433,769, to $434,711,118, but there were very extensive adjustments. There were added to surplus the following items: Surplus net income for the year, $108,523,343; refunds received in 1929 of Federal income and excess profits taxes of previous years, $15,756,596; balance of inventory reserve, $47,076,404.

This inventory reserve, now eliminated, had an interesting history. It was set up during the War in anticipation of possible price deflation, and reached a maximum, $95,000,000, December 31, 1920, this being 27 per cent of the inventory as taken, whereby so much less was carried into the asset side of the balance sheet. Year by year the reserve was drawn upon, but now the remainder, practically half the maximum of nine years earlier, is abandoned as no longer needed.

Charges to and appropriations of surplus include the following: Premium and unamortized discount on bonds retired or called during the year, $40,626,554; amortization of appreciated cost of subsidiary company shares in excess of their investment in tangible property, $88,296,020; organization capital of $25,000,000, now written off in reduction of property investment account.

On the asset side of the balance sheet the property investment account, after numerous and large adjustments, is reduced by $119,631,382, from $1,661,123,969 to $1,541,492,587. General and reserve fund assets are reduced by $43,893,492, largely on account of the bond retirement. Current assets show practically no change, having stood at the beginning and end of the year at a trifle above $560,000,000. Sundry marketable securities increased some three million, time and other special bank deposits decreased six million and cash decreased $21,434,070, the net decrease in the three items being $24,159,693. Thus in retiring bonds the corporation did not after all decrease its cash and equivalent to any material extent.

All told, the Steel Corporation is left in remarkably strong position. At the end of its first full year there were in the hands of the public $360,754,327 of corporation and subsidiary company bonds. By retirement of preferred stock, acquisition of the Tennessee company and various improvements the outstanding bonds reached a maximum of $600,185,271 on December 31, 1907. At the end of last year the total was only $104,166,978, while there is $360,281,100 preferred stock against $510,281,100 at the outset, the only change having been the retirement in 1903 by issuing second mortgage bonds.

The net property account of $1,325,267,583 in the balance sheet of December 31, 1902, is replaced by $1,541,492,587 in the balance sheet just issued. Meanwhile the actual increase in value of property is tremendous, quite beyond any engineering appraisal.

The High Price of Scrap

HEAVY melting steel scrap is at rather a high price relative to levels in the recent past. As the price has been more or less subject to seasonal swings, comparison should be made with March of other years. THE IRON AGE composite price for heavy melting steel scrap, while under March, 1929, is above March in each of the two preceding years. (These prices are: March, 1927, $14.65; March, 1928, $13.65; March, 1929, $16.71, and for 25 days of March this year, $14.88.)

In each of these other years the steel trade was very active in March and the outlook was promising, even though in 1927 things did turn out badly for the second half of the year.

In the past, scrap prices have moved up and down in keeping with ups and downs in the steel trade, being cheap in depressed and dear in active periods.

The movements have not been precisely contemporaneous, high and low spots in scrap usually preceding by a few weeks downward and upward swings in the rate of steel production. On that account it has sometimes appeared that the course of the scrap market could be taken as barometric of the rate of steel production—that, when scrap prices started to move upward, heavier steel production could be expected, and vice versa. The rule, if it may be called one, has sometimes failed, possibly because when a rule is formulated men try to use it and thus by their actions they may forestall the expected outcome. A notable instance of the principle not working was in the summer of 1928. In that year production of steel ingots reached its low point in June instead of the usual July, but scrap was cheaper in July than in June.

Either there is not a depression, even a mild one, at the present time, or the relatively high price of scrap needs to be explained. The behavior of prices in the past would indicate that scrap acts like a manufactured commodity, thus being influenced by

the law of supply and demand, the supply of scrap tending to vary less than the demand.

From this viewpoint it would appear that the outcome of scrap lately has not been fully up to ratio with the volume of steel production. One important influence is that the automobile industry, which produces an unusual proportion of scrap relative to its purchases of steel, has been a light buyer of steel, but no other case of importance can be picked out among consuming industries. Railroad scrap lists are running much the same as formerly. On the whole, railroads are very steady producers of scrap in good times and bad. They vary more in their freight car purchases than they do in their freight car retirements.

Of late the large dealers in iron and steel scrap, who sell to the steel producers, have been complaining that there is much direct dealing, mills selling their steel to industries and contracting to take the customer's scrap. The dealers are preparing a case and hope to present the matter to the mills in such light that the mills will be disposed to renounce this direct trading and let the business revert to the dealers.

If the dealers should now find themselves able to show the mills that this direct trading has lately been having a tendency to bolster scrap prices, they will score an important point, for it is not merely a matter of how much scrap as a raw material costs the mill. The dealers claim that this direct trading allows the mill in some cases to offer an undue price for scrap when trying to sell steel, thus in essence cutting the price on its product. As the mills have enough competition without allowing this insidious form to enter, the scrap dealers would have a good case if they could prove the circumstances.

CORRESPONDENCE

Fair Comparisons of Performance Records

To the Editor:—I have enjoyed reading the article, "Foundries Use Gas for Annealing," by C. B. Phillips, vice-president, Surface Combustion Co., in Feb. 27 issue of THE IRON AGE. Commenting on the cost comparisons in the article, particularly with respect to oil, Mr. Phillips rather leaves the impression with the reader that the oil-fired annealing oven cannot compete economically with the gas-fired oven, which seems to be substantiated by the fact that the Link-Belt Co., whose experience Mr. Phillips has described, has discarded the oil in favor of gas.

Using the unit cost rates for fuel given in the article, I can find nothing which would indicate that gas is cheaper than oil; in fact, the contrary seems to be true.

530 B.t.u. gas at 60c. per 1000 cu. ft. is equivalent to a fuel cost of $1.13 per million B.t.u.
Fuel oil at 9.79c. per gal. and 144,000 B.t.u. per gal. is equivalent to a fuel cost of 68c. per million B.t.u.

Other things equal, annealing with fuel oil is cheaper by 45c. per million B.t.u. applied, or 39.8 per cent. Using the figure of 4000 cu. ft. of gas per ton castings annealed, as in the example comparing gas with electric heating, the fuel cost using gas is shown to be $2.40 per ton annealed. Using fuel oil, the cost would be $1.44 per ton annealed.

The difference in fuel cost between gas and oil in favor of oil is really considerable and the foundryman contemplating a new oven, or looking for a means to lower his annealing costs, will do well to consider the merits of fuel oil before making a decision.

In the cost comparisons above, which were obtained from the article in question, nothing has been mentioned as to furnace and burner maintenance when using gas. On the other hand, an unreasonably high figure has been used on oil. Brought to the same basis of comparison, the differential cost in favor of fuel oil would be even greater.

All Factors Should Be Fairly Stated

If I may, I would take this opportunity of criticising in general many descriptive articles written by enthusiastic partisans of one fuel or another, with the net result that the reader is left confused and, in the end, if he has had no specialized experience, he has no data that may be considered unprejudiced with which to guide himself.

To be more specific, for example, one will read an article describing a new oven burning, say, coke oven gas. In the article will be shown operating cost comparisons of the new oven and the old oven which, we will say, unfortunately happened to be fired with oil. The new oven has been built in the most approved manner, using insulation and new equipment throughout to turn out good product and at the same time conserve fuel. The old oven, with no insulation, of poor design, usually operated at low capacity and with worn out or obsolete oil-burner equipment, must rightly stand the brunt when comparisons are made.

In this connection, however, the reader generally would get the impression that the improvement was due to the change from oil to gas. Comparisons, when made, should be specifically qualified.

An oil-fired oven designed correctly, insulated, having comparable facilities and equipped with low-pressure oil burners of proved design, should give just as good results as a new gas installation.

The above has been written in a spirit of constructive criticism, and is the writer's honest opinion of the shortcomings of many articles which fail entirely to qualify comparisons.

R. S. COULTER,
Consulting Combustion Engineer.
Lebanon, Pa., March 20.

Manganese Production in United States in 1928

THE above is the title of an advance chapter of Mineral Resources of the United States, written by Lewis A. Smith, of the Department of Commerce. Production of metallurgical ore in the United States in 1928 increased about 13 per cent to 31,430 gross tons of 35 per cent ore or richer, valued at $593,561. Imports were at a decreased rate, the domestic users drawing heavily on their storage piles. Deposits of low-grade ore were discovered in New Mexico, Nevada and South Dakota.

Mr. Smith summarizes the situation, with respect to the development of the low-grade manganese ores in the United States as follows: "It appears that considerable technical advance has been made in beneficiation and that several processes that will produce a high-grade product have been devised. However, to date, only one of these processes has been tried in large-scale operations—the successful roasting of rhodochrosite ores in the Butte district."

Seven American plants made 320,000 gross tons of ferromanganese in 1928, nearly all from imported ore, and 61,000 tons of alloy was imported from Canada, United Kingdom and Norway. Metallurgical practice has been improved so that the quantity of ore required per ton of ferromanganese decreased from 2 tons in 1927 to 1.89 tons in 1928.

The Week in Business

Drift of Current Financial and Economic Opinion

REPORTS from the various industries "indicate," says the Chamber of Commerce of the United States, "that the importance laid upon construction as an influence in restoring industrial balance has not been over-emphasized. They show that for a revival of construction . . . a first requirement is adequate and reasonably priced credit."

Other commentators take this same view. The Harvard Economic Society believes that "As an obstacle to recovery in construction, stringency of mortgage money will become of decreasing importance. . . . Ease such as is now displayed in the market for short-term funds inevitably works its way into other fields." On this topic the *Annalist* notes that, though the second week of March showed an improvement of 45 per cent over the first week, this "is far below the corresponding period of 1929."

Declining Prices Bothersome

Because it causes future commitments to be deferred, "the fall in the general level of commodity prices is a disturbing factor of importance in the present situation," says the National Industrial Conference Board. "While it seems probable that the present price decline is not a part of any major downward movement, no one feels sure as to whether present levels mark the real bottom. . . . With world-wide ease in money rates, a good basis probably is being laid for a stronger forward movement. The best hope for the initial impulse which will start general business activity upward seems to lie in the construction programs of public and private corporations."

No Depression Is Discernible

While "industry is a shade less active," says *Commerce and Finance*, "evidence of a prolonged or acute business depression is hard to find, and the decline in agricultural commodities is almost the only serious feature of the present situation. This decline began when the Federal Farm Board commenced to function. There is some reason to hope that it was ended last week, when there was a slight recovery in cotton and wheat."

Hopes are, again, a feature of the review by J. S. Bache & Co: "There is a little more cheerful tone in the reports on business, but it reveals more a basis of hopes rather than actual happenings. Cheap money is generally a great tonic in helping business revival, and it is on this that most of the hopes are based."

Price Stability Is Desirable

Continued softness of commodity prices is cited by *Bankshares Review* as "the most obvious adverse factor of recent weeks." This is noted mostly in raw materials, for, "fortunately, we do not have to deal with any serious over-accumulation of finished goods."

"If we can achieve during the coming months," thinks Leonard P. Ayres, "a fair degree of stability of prices, even at lower levels, it seems probable that we may look forward to a gradual recovery which should culminate in good business by early autumn. . . . The most outstanding favorable factors have been repeatedly mentioned—the strong cash position of our large industries, minimum inventories, hand-to-mouth buying, reserve public buying power and an ample supply of credit."

Colonel Ayres says, however, that "it is evident that the reaction from last year's peaks of production and speculation is proving more far-reaching than was at first anticipated, and that, therefore, the necessary readjustment is going to take somewhat longer than was expected."

Outlook Held Favorable

While "recovery in general business may be subject to temporary checks," the Harvard Economic Society states that "the outlook continues favorable for improvement. . . . The decline which dominated business activity in recent months is being replaced by normal seasonal movements."

Decline in Exports, While Imports Gain

WASHINGTON, March 25.—Exports of iron and steel products from the United States in February reflected the usual decline for that month. They dropped to 197,426 gross tons, according to preliminary figures prepared by the Iron and Steel Division, Department of Commerce. The February outgoing movement was the lowest since February, 1928, when exports were 185,907 tons, and represented a decline of 27,664 tons from exports in January, totaling 225,090 tons.

Imports in February rose to 43,351 tons from 42,314 tons in January.

The principal tonnage product exported in February was scrap, 42,195 tons. Other important products were tin plate, 23,497 tons; plain structural shapes, 15,265 tons; and fabricated structural shapes, 11,146 tons. Exports to Canada were 77,056 tons and to Japan, 40,414 tons, both reflecting increased movements to those countries.

Structural shapes, 12,402 tons, formed the principal item of importation. Incoming shipments of pig iron totaled 8900 tons and ferromanganese, 5135 tons. Belgium supplied the largest total imports, 9542 tons, with Germany a close second, providing 9200 tons.

Carpenter Steel Co. to Electrify Mills

An order received by Westinghouse Electric & Mfg. Co., East Pittsburgh, from Carpenter Steel Co., Reading, Pa., calls for most of the equipment required to electrify its merchant bar mills. This consists of six d.c. motors (two 600-hp., two 750-hp., and two 1000-hp.), two 1000-kw. motor-generator sets, and switching and control apparatus. This equipment will eliminate a half-mile carry of steam across the Schuylkill River.

German Steel Output at 78 Per Cent

WASHINGTON, March 25.—With 93 blast furnaces operating, production of pig iron in Germany in February totaled 964,517 metric tons, representing 66.3 per cent of capacity, according to a radiogram received by the Department of Commerce from Berlin. Steel ingot output was 1,176,435 tons, or 77.8 per cent of capacity.

Tube Mill to Be Scrapped

The Monongahela Tube Co., Clairton, Pa., manufacturer of boiler tubes, has been sold to the Max Solomon Co., Oliver Building, Pittsburgh, and the plant will be dismantled and scrapped. The Monongahela company operated its plant up until a few weeks ago, and business will be discontinued without financial difficulties.

Iron and Steel Markets

Production Shows Slight Upturn

Placing of 100,000 Tons of Plates for Pipe and Other Evidences of Seasonal Demand Are Encouraging—Prices Unsettled

SENTIMENT has improved in the iron and steel trade, but to what extent this change is based on hopes rather than on justifiable expectations is still uncertain. Among favorable straws are an upturn in steel production, following a continuous decline since the middle of February, and scattered evidences of better demand.

Although neither the gain in output nor the expansion of business is large, the pronounced conservatism of buyers makes the industry unusually sensitive to fluctuations in the requirements of its customers. Mill backlogs are small, and price unsettlement discourages forward contracting. Hence any rise in commitments can be safely regarded as reflecting an increase in the actual needs of the consuming trade.

The ingot output of the two largest producers continues at slightly above 80 per cent, but the operations of some of the smaller interests have shown improvement, raising the average for the entire country to 76 per cent, compared with a shade below 75 per cent a week ago. The rates for the two leading steel centers, Pittsburgh and Chicago, remain unchanged at 75 and 95 per cent respectively.

The most impressive indication of a seasonal upturn in business is seen in the placing of 100,000 tons of plates with Chicago mills for gas and oil pipe, including 60,000 tons for a 24-in. gas line from Texas to Omaha. On top of these bookings, the steel trade looks for considerable business in pipe for gasoline-carrying lines, in which oil companies are showing a growing interest. The Gulf Refining Co. is mentioned as planning a gasoline line across the State of Pennsylvania, similar to that contemplated by the Sun Oil Co.

Seasonal influences are also seen in better orders for sheets and other light rolled products from sources other than the automobile industry and in the rounding out of a record-breaking highway program, which promises to get under way in April. Bookings of sheet mills thus far in March are estimated at 70 per cent of capacity.

Less reassuring are the week's developments among consuming lines that have been giving the steel industry its greatest support. Structural steel awards, at 20,000 tons, are the smallest since the end of February and compare with 37,000 tons a week ago. Pending inquiries for freight cars are the smallest in a year, and the week's purchases were limited to 500 cars.

The New York Central, Pennsylvania, Chicago & North Western, Illinois Central and Union Pacific are reported as possible buyers, but it is realized that their inquiries hinge on the trend of car loadings when the full volume of spring activity can be gaged. Repairs on 1000 gondola cars for the Virginian Railway will require 8000 to 10,000 tons of steel.

The high pace of the farm equipment industry has been halted, as builders of tractors and tillage tools prepare to go on lighter schedules, but it is said that a large production of harvesting machinery is being planned.

In the automobile industry a few manufacturers have slightly increased production, but no material gain in motor car output is expected until May. However, releases from the automotive trade last week enabled a number of sheet mills to step up their operations.

Demand for standard pipe has improved slightly and makers of building materials are taking more tonnage in sheets and other finished products, but prospects in residential construction are not considered bright. Many cities are believed to be overbuilt, and foreclosures and tax sales discourage new work.

The scrap market, which is closely watched for any light it may throw on the future course of steel business, gives no signs of recovery. Price weakness is general, and heavy melting grade has declined 25c. at Pittsburgh and Chicago and 50c. a ton at Philadelphia.

Nor can the status of finished steel prices be considered encouraging. Mills have been willing, in some cases, to accept prompt business at concessions, although holding firm on second quarter contracts. However, there is little consumer interest in forward commitments, and the situation has been further unsettled by the success of large buyers in obtaining extensions of low-priced contracts placed early in the year.

With the entire price structure flexible, automobile body sheets have generally declined $2 a ton to 3.80c., Pittsburgh, and hot-rolled strips are off $1 a ton to 1.75c. for wide and 1.85c. for narrow. At Chicago, plates and shapes have receded $1 a ton to 1.90c.

Pig iron buying has increased at Cleveland, New York and Buffalo, but melt is spotty, with indications of definite improvement limited mainly to Chicago and St. Louis. March shipments of pig iron in the Chicago district will exceed those of February by 10 per cent. Many foundries, notably those identified with the automobile industry, will carry considerable iron into the second quarter. Makers of merchant iron in the Valleys are piling metal.

Ocean mail contracts awarded by the Postmaster General call for the construction of 14 ships, requiring a total of 30,000 tons of steel. The United Fruit Co. will build eight, the Roosevelt Steamship Co. five, and the Grace Lines one. The Newport News Shipbuilding & Dry Dock Co. has contracts for two ocean vessels, requiring a total of 5000 tons of steel.

A Comparison of Prices

Market Prices at Date, and One Week, One Month and One Year Previous, Advances Over Past Week in Heavy Type, Declines in Italics

Pig Iron, Per Gross Ton:	Mar. 25, 1930	Mar. 18, 1930	Feb. 25, 1930	Mar. 26, 1929
No. 2 fdy., Philadelphia	$20.26	$20.26	$20.76	$21.76
No. 2, Valley furnace	18.50	18.50	18.50	18.00
No. 2 Southern, Cin'ti	16.69	16.69	16.69	19.19
No. 2, Birmingham	14.00	14.00	15.00	15.50
No. 2 foundry, Chicago*	19.50	19.50	20.00	20.00
Basic, del'd eastern Pa	19.00	19.00	19.25	20.25
Basic, Valley furnace	18.50	18.50	18.50	17.50
Valley Bessemer, del'd P'gh	20.76	20.76	20.76	20.26
Malleable, Chicago*	19.50	19.50	20.00	20.00
Malleable, Valley	19.00	19.00	19.00	18.50
L. S. charcoal, Chicago	**27.04**	23.04	27.04	27.04
Ferromanganese, furnace	94.00	94.00	94.00	105.00
Rails, Billets, Etc., Per Gross Ton:				
Rails, heavy, at mill	$43.00	$43.00	$43.00	$43.00
Light rails at mill	36.00	36.00	36.00	36.00
Rerolling billets, Pittsburgh	33.00	33.00	33.00	34.00
Sheet bars, Pittsburgh	33.00	33.00	33.00	35.00
Slabs, Pittsburgh	33.00	33.00	33.00	34.00
Forging billets, Pittsburgh	38.00	38.00	38.00	39.00
Wire rods, Pittsburgh	38.00	38.00	39.00	42.00
	Cents	Cents	Cents	Cents
Skelp, grvd. steel, P'gh, lb	1.85	1.85	1.85	1.85
Finished Steel.				
Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Bars, Pittsburgh	1.85	1.85	1.85	1.90
Bars, Chicago	1.95	1.95	1.95	2.05
Bars, Cleveland	1.85	1.85	1.85	1.95
Bars, New York	2.19	2.19	2.19	2.24
Tank plates, Pittsburgh	1.80	1.80	1.80	1.90
Tank plates, Chicago	*1.90*	1.95	1.95	2.05
Tank plates, New York	2.07½	2.07½	2.07½	2.17½
Structural shapes, Pittsburgh	1.80	1.80	1.80	1.90
Structural shapes, Chicago	*1.90*	1.95	1.95	2.05
Structural shapes, New York	2.04½	2.04½	2.04½	2.14½
Cold-finished bars, Pittsburgh	2.10	2.10	2.10	2.20
Hot-rolled strips, Pittsburgh	*1.75*	1.80	1.80	1.80
Cold-rolled strips, Pittsburgh	2.55	2.55	2.65	2.75

*The average switching charge for delivery to foundries in the Chicago district is 61c. per ton.

Finished Steel.	Mar. 25, 1930	Mar. 18, 1930	Feb. 25, 1930	Mar. 26, 1929
Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Sheets, black, No. 24, P'gh	2.65	2.65	2.65	2.85
Sheets, black, No. 24, Chicago dist. mill	2.75	2.75	2.75	3.05
Sheets, galv., No. 24, P'gh	3.30	3.30	3.30	3.60
Sheets, galv., No. 24, Chicago dist. mill	3.40	3.40	3.40	3.80
Sheets, blue, No. 13, P'gh	2.25	2.25	2.25	2.10
Sheets, blue, No. 13, Chicago dist. mill	2.35	2.35	2.35	2.30
Wire nails, Pittsburgh	2.25	2.25	2.25	2.65
Wire nails, Chicago dist. mill	2.35	2.35	2.35	2.70
Plain wire, Pittsburgh	2.40	2.40	2.40	2.50
Plain wire, Chicago dist. mill	2.45	2.45	2.45	2.55
Barbed wire, galv., P'gh	2.95	2.95	2.95	3.30
Barbed wire, galv., Chicago dist. mill	3.00	3.00	3.00	3.35
Tin plate, 100 lb. box, P'gh	$5.25	$5.25	$5.25	$5.35
Old Material, Per Gross Ton:				
Heavy melting steel, P'gh	*$16.25*	$16.50	$16.50	$18.50
Heavy melting steel, Phila	*14.50*	15.00	15.00	16.50
Heavy melting steel, Ch'go	*13.00*	13.25	13.50	15.75
Carwheels, Chicago	14.50	14.50	15.00	14.50
Carwheels, Philadelphia	15.00	15.00	15.00	16.50
No. 1 cast, Pittsburgh	14.50	14.50	14.50	15.25
No. 1 cast, Philadelphia	15.00	15.00	15.00	16.00
No. 1 cast, Ch'go (net ton)	13.75	13.75	14.00	16.00
No. 1 RR. wrot., Phila	15.00	15.00	15.00	16.00
No. 1 RR. wrot., Ch'go (net)	12.25	12.25	12.25	14.00
Coke, Connellsville, Per Net Ton at Oven:				
Furnace coke, prompt	$2.60	$2.60	$2.60	$2.90
Foundry coke, prompt	3.50	3.50	3.50	3.75
Metals,				
Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Lake copper, New York	18.12½	18.12½	18.12½	24.12½
Electrolytic copper, refinery	17.75	17.75	17.75	23.75
Tin (Straits), New York	**37.87½**	36.12½	38.12½	48.75
Zinc, East St. Louis	*4.85*	4.95	5.15	6.60
Zinc, New York	*5.20*	5.30	5.50	6.95
Lead, St. Louis	**5.55**	5.40	6.10	7.65
Lead, New York	**5.65**	5.50	6.25	7.75
Antimony (Asiatic), N. Y.	7.87½	8.00	9.00	9.75

On export business there are frequent variations from the above prices. Also, in domestic business, there is at times a range of prices on various products, as shown in our market reports on other pages.

Pittsburgh

Signs of Spotty Improvement but No Widespread Gains in Steel Buying—Price Weakness in Some Lines

PITTSBURGH, March 25.—The steel market has developed a somewhat better tone in the last week, although there has been no perceptible increase in specifications except in isolated cases. One maker of cold-finished steel bars reports a slight acceleration in demand from industries other than the automotive, and tonnage releases on black and galvanized sheets have been a little heavier with some mills. Business in standard pipe is beginning to show seasonal improvement, and on steel products in general consumers seem to be showing more interest in their second quarter requirements. Most of them are still hesitant in placing future contracts, but this is prompted by price weakness in many cases rather than the prospect of curtailed consumption of steel.

Steel ingot operations in the immediate Pittsburgh district are holding at about 75 per cent of capacity, a rate which is in close alinement with the current requirements of finishing mills.

Rail production is at capacity and structural mills are well engaged. Output of tin plate is not lower than 85 per cent of theoretical full capacity, and a few of the large independent producers are at capacity. Production of sheets and strips is still light and subject to interruption through lack of orders. Butt-weld pipe units are running at a slightly better rate, although the pipe industry as a whole is under 50 per cent of maximum output.

The automobile industry is not showing much improvement, although some motor car makers plan higher schedules for April than they have maintained in March. The two largest interests are contributing considerably more than their usual percentage of automotive steel.

Building projects are somewhat more numerous with the arrival of open weather, and are expected to give impetus to several steel lines. New pipe line projects are being figured. The Gulf Refining Co. is said to be planning a gasoline-carrying pipe line across the State of Pennsylvania, similar to that planned by the Sun Oil Co.

Railroad purchases of steel are rather light at the moment, but one large Eastern road is expected to come into the market for several thousand freight cars next month.

Prices have not gained strength, and on some flat-rolled products are weaker. Automobile body sheets are being sold more freely at prices lower than 3.90c., Pittsburgh, and the market is now quotable at 3.80c. to 3.90c. Shading of quotations on hot-rolled strip seems to be spreading, but only unusual tonnages are bringing out concessions. Common finishes of sheets are now rather well established at the present quotations, attempts to get higher prices for second quarter having been largely abandoned. The sheet market in general seems to be somewhat stronger for second quarter buying than it is on spot business. Bars, plates and shapes are not strong, but concessions are confined to large transactions which do not seriously affect the quoted market.

Pig Iron.—One or two sellers report increased activity, although business is still confined mostly to small lots for prompt delivery. A few of the

larger consumers in the district have been sounding out the market recently, but specific inquiries are still lacking. Nearly all of the merchant stacks are accumulating stocks, but a resumption of activity on the part of some of the smaller steel companies in the district would again put shipments ahead of production with some of them. Small lots of foundry iron are regularly bringing $18.50, Valley, while malleable and Bessemer are steady at $19. The basic market has not been tested by sales for several weeks, but is still quoted at $18.50.

The Davison Coke & Iron Co. plans to blow in its Neville Island, Pittsburgh, furnace next week, and will blow out the Sharpsville stack at the same time.

Prices per gross ton, f.o.b. Valley furnace:

Basic	$18.50
Bessemer	19.00
Gray forge	18.00
No. 2 foundry	18.50
No. 3 foundry	18.00
Malleable	19.00
Low phos., copper free	27.00

Freight rate to Pittsburgh or Cleveland district, $1.76.

Prices per gross ton, f.o.b. Pittsburgh district furnace:

Basic	$19.00
No. 2 foundry	19.00
No. 3 foundry	18.50
Malleable	19.50

Freight rates to points in Pittsburgh district range from 63c. to $1.13.

Semi-Finished Steel.—Consumers of semi-finished steel are in no hurry to contract for their second quarter requirements, and in many cases will be protected through April on old contracts. In some cases rather large accumulations of crude steel have been built up since the first of the year, but the tendency toward curtailed open-hearth production has become more pronounced in the last two or three weeks, and additions to stock at this time are by no means important.

The price of billets, slabs and sheet bars remains at $33, Pittsburgh, but is being given little test in the open market. Sales of forging billets at $38, Pittsburgh, are reported, and some second quarter contracting has taken place at this figure. Shipments of wire rods are comparatively light and rather spotty. The price seems well established at $38, Pittsburgh or Cleveland, and leading producers have covered most of their customers for second quarter at this figure. If contracts have not been signed, the price has rarely been the reason for delayed action.

Bars, Plates and Shapes.—Business is holding at about the average for the last three or four weeks. There is a fairly steady demand from some consuming lines, but aggregate tonnage reaching mills is still disappointing.

The railroads, which have been a rather favorable factor in the plate market over the last few months, are doing very little at this time, and roads which had been expected to inquire for freight cars early this year will probably do nothing until the full volume of spring activity can be gaged. The New York Central is expected to inquire for several thousand freight cars next month, but its action is by no means definitely assured. The Standard Unit Navigation Co., which took bids last week on 50 to 60 river barges, has rejected the figures submitted and will soon take new bids on a slightly altered design. Otherwise, the barge market is quiet. Specifications from railroad car builders are in fair volume, and seem to be increasing slightly. Production of structural shapes continues heavy, but the requirements of the smaller fabricating shops are declining and backlogs are being reduced. The Independent Bridge Co. has taken 1200 tons for a bridge at Turtle Creek, Pa.

Movement of bars would be fairly good if the automobile industry were taking steel in normal volume. Manufacturers of farm implements and road making machinery are busy, and prospective reinforcing bar tonnage is in large volume. Most of this work is rather slow being placed.

Prices lack strength largely because many of the larger buyers which placed tonnage two or three months ago at figures under the present quoted market are insisting upon renewing their contracts at the same level. In many cases they have been able to do this, and the average billing price of bars, plates and shapes in the second quarter may be slightly under the present levels of 1.85c., Pittsburgh, on bars, and 1.80c. to 1.85c. on plates and shapes.

Rail and Track Supplies.—This market is very quiet and is not yet feeling any marked signs of spring activity. A few roads have placed their second quarter requirements, but new business is not being added to order books in any considerable volume. Shipments will be somewhat heavier in the first weeks of the new month, but are rather light at present. Prices are being generally adhered to.

Tubular Goods.—Line pipe activity continues to be the feature of the market, although actual lettings are not numerous. Added to the list of possible projects which may be placed during the year is a gas line from the West Virginia fields to Baltimore and other Atlantic Seaboard points. The oil industry shows a somewhat better tone in the California fields, on account of an advance in crude prices and reported progress in conservation programs. Conditions in the mid-continent fields are still very depressed, and offer little hope for much pipe business this year. Demand for mechanical tubing is not as strong as it was last month, but movement of standard butt-weld pipe is beginning to show a slight increase. Boiler tubes are slightly more active than other light tubular products. Pipe mill operations in this and nearby districts do not average better than 40 to 50 per cent.

Wire Products.—Reports that the price of manufacturers' wire has weakened in the last few days seem to have originated from the fact that a few carloads of annealed fence wire have been sold at 2.30c., Pittsburgh, which is the quoted schedule on this product. Bright hard wire for the manufacturing trade has been sold at a $2 premium for several months, and producers are not meeting with much opposition in taking contracts for the second quarter at 2.40c., Pittsburgh, for this material.

Prices on nails and other merchant wire products are rather weak, but $2.30, Pittsburgh, seems to be the minimum on second quarter tonnage. Present shipments are being made at lower figures, but such contracts are being renewed only in isolated cases. Shipments of fencing and other merchant products are increasing seasonably, but jobbers' stocks are ample,

The Iron Age Composite Prices

Finished Steel

March 25, 1930, 2.312c. a Lb.

One week ago	2.312c.
One month ago	2.312c.
One year ago	2.391c.

Based on steel bars, beams, tank plates, wire, rails, black pipe and black sheets. These products make 87 per cent of the United States output of finished steel.

	High	Low
1930	2.362c., Jan. 7	2.305c., Jan. 28
1929	2.412c., April 2	2.362c., Oct. 29
1928	2.391c., Dec. 11	2.314c., Jan. 3
1927	2.453c., Jan. 4	2.293c., Oct. 25
1926	2.453c., Jan. 5	2.403c., May 18
1925	2.560c., Jan. 6	2.396c., Aug. 18

Pig Iron

March 25, 1930, $17.75 a Gross Ton

One week ago	$17.75
One month ago	17.92
One year ago	18.38

Based on average of basic iron at Valley furnace and foundry irons at Chicago, Philadelphia, Buffalo, Valley and Birmingham.

	High	Low
1930	$18.21, Jan. 7	$17.75, Mar. 4
1929	18.71, May 14	18.21, Dec. 17
1928	18.59, Nov. 27	17.04, July 24
1927	19.71, Jan. 4	17.54, Nov. 1
1926	21.54, Jan. 5	19.46, July 13
1925	22.50, Jan. 13	18.96, July 7

Mill Prices of Finished Iron and Steel Products

Iron and Steel Bars

Soft Steel

	Base per Lb.
F.o.b. Pittsburgh mill	1.85c.
F.o.b. Chicago	1.95c. to 2.00c.
Del'd Philadelphia	2.17c. to 2.22c.
Del'd New York	2.19c. to 2.24c.
Del'd Cleveland	1.85c.
F.o.b. Cleveland	1.85c.
F.o.b. Lackawanna	2.00c.
F.o.b. Birmingham	2.00c.
C.i.f. Pacific ports	2.35c.
F.o.b. San Francisco mills	2.35c.

Billet Steel Reinforcing

F.o.b. Pittsburgh mills, 40, 50, 60-ft.	1.95c.
F.o.b. Pittsburgh mills, cut lengths	2.20c.
F.o.b. Birmingham, mill lengths	2.00c.

Rail Steel

F.o.b. mills, east of Chicago dist.	1.80c. to 1.90c.
F.o.b. Chicago Heights mill	1.85c.
Del'd Philadelphia	2.12c. to 2.22c.

Iron

Common iron, f.o.b. Chicago	1.95c. to 2.00c.
Refined iron, f.o.b. P'gh mills	2.75c.
Common iron, del'd Philadelphia	2.12c.
Common iron, del'd New York	2.14c.

Tank Plates

	Base per Lb.
F.o.b. Pittsburgh mill	1.80c. to 1.85c.
F.o.b. Chicago	1.90c. to 2.00c.
F.o.b. Birmingham	2.00c.
Del'd Cleveland	1.99c. to 2.04c.
Del'd Philadelphia	1.95c. to 2.00c.
F.o.b. Coatesville	1.85c. to 1.90c.
F.o.b. Sparrows Point	1.90c. to 1.95c.
F.o.b. Lackawanna	1.90c. to 1.95c.
Del'd New York	2.07½c. to 2.12½c.
C.i.f. Pacific ports	2.20c.

Structural Shapes

	Base per Lb.
F.o.b. Pittsburgh mill	1.80c. to 1.85c.
F.o.b. Chicago	1.90c. to 2.00c.
F.o.b. Birmingham	2.00c.
F.o.b. Lackawanna	1.90c. to 1.95c.
F.o.b. Bethlehem	1.90c. to 1.95c.
Del'd Cleveland	2.04c.
Del'd Philadelphia	1.81c. to 1.86c.
Del'd New York	2.04½c. to 2.09½c.
C.i.f. Pacific Ports	2.35c.

Hot-Rolled Hoops, Bands and Strips

	Base per Lb.
6 in. and narrower, P'gh	1.85c. to 1.90c.
Wider than 6 in., P'gh	1.75c. to 1.80c.
6 in. and narrower, Chicago	1.95c. to 2.00c.
Wider than 6 in., Chicago	1.85c. to 1.90c.
Cooperage stock, P'gh	2.20c.
Cooperage stock, Chicago	2.30c.

Cold-Finished Steel

	Base per Lb.
Bars, f.o.b. Pittsburgh mill	2.10c.
Bars, f.o.b. Chicago	2.10c.
Bars, Cleveland	2.10c.
Bars, Buffalo	2.10c.
Shafting, ground, f.o.b. mill	*2.45c. to 3.40c.
Strips, P'gh	2.55c. to 2.65c.
Strips, Cleveland	2.55c. to 2.65c.
Strips, del'd Chicago	2.85c. to 2.95c.
Strips, Worcester	2.80c. to 2.90c.
Fender stock, No. 20 gage, Pittsburgh or Cleveland	3.90c. to 4.00c.

*According to size.

Wire Products

(Carload lots, f.o.b. Pittsburgh and Cleveland.)

To Merchant Trade

	Base per Keg
Standard wire nails	$2.30
Cement coated nails	2.30
Galvanized nails	4.30

	Base per Lb.
Polished staples	2.75c.
Galvanized staples	3.00c.
Barbed wire, galvanized	2.95c.
Annealed fence wire	2.45c.
Galvanized wire, No. 9	2.90c.
Woven wire fence (per net ton to retailers)	$65.00

To Manufacturing Trade

Bright hard wire, Nos. 6 to 9 gage	2.40c.
Spring wire	3.50c.

(Carload lots, f.o.b. Chicago)

Wire nails	$2.35 to $2.45 (keg)
Annealed fence wire	2.50c. to 2.60c. (lb.)
Bright hard wire to manufacturing trade	2.45c.

Anderson, Ind., mill prices are ordinarily $1 a ton over Pittsburgh base; Duluth, Minn., mill $2 a ton over Pittsburgh, and Birmingham mill $3 a ton over Pittsburgh.

Cut Nails

	Per 100 Lb.
Carloads, Wheeling, Reading or Northumberland, Pa.	$2.55 to $2.60
Less carloads, Wheeling or Reading	2.70

Light Plates

No. 10, blue annealed, f.o.b. P'gh	2.10c.
No. 10, blue annealed, f.o.b. Chicago dist.	2.20c.
No. 10, blue annealed, del'd Phila.	2.42c.
No. 10, blue annealed, B'ham	2.25c.

Sheets

Blue Annealed

	Base per Lb.
No. 13, f.o.b. P'gh	2.25c.
No. 13, f.o.b. Chicago dist.	2.35c.
No. 13, del'd Philadelphia	2.57c.
No. 13, blue annealed, B'ham	2.50c.

Continuous Mill Sheets

No. 10 gage, f.o.b. P'gh	1.80c. to 1.90c.
No. 13 gage, f.o.b. P'gh	1.95c. to 2.05c.

(Usual range 24 in. to 48 in. wide.)

Box Annealed, One Pass Cold Rolled

No. 24, f.o.b. Pittsburgh	2.65c.
No. 24, f.o.b. Chicago dist. mill	2.75c.
No. 24, del'd Philadelphia	2.97c.
No. 24, f.o.b. Birmingham	2.90c.

Metal Furniture Sheets

No. 24, f.o.b. P'gh	3.90c. to 4.00c.

Galvanized

No. 24, f.o.b. Pittsburgh	3.30c.
No. 24, f.o.b. Chicago dist. mill	3.40c.
No. 24, del'd Cleveland	3.49c.
No. 24, del'd Philadelphia	3.62c.
No. 24, f.o.b. Birmingham	3.45c.

Tin Mill Black Plate

No. 28, f.o.b. Pittsburgh	2.80c. to 2.90c.
No. 28, f.o.b. Chicago dist. mill	3.00c. to 3.10c.

Automobile Body Sheets

No. 20, f.o.b. Pittsburgh	3.80c. to 3.90c.

Long Ternes

No. 24, 8-lb. coating, f.o.b. mill	3.90c. to 4.00c.

Vitreous Enameling Stock

No. 24, f.o.b. Pittsburgh	3.90c.

Tin Plate

	Per Base Box
Standard cokes, f.o.b. P'gh district mills	$5.25
Standard cokes, f.o.b. Gary	5.35

Terne Plate

(*F.o.b. Morgantown or Pittsburgh*)
(Per Package, 20 x 28 in.)

8-lb. coating I.C.	$10.70
15-lb. coating I.C.	13.40
20-lb. coating I.C.	14.60
25-lb. coating I.C.	$15.90
30-lb. coating I.C.	16.80
40-lb. coating I.C.	18.80

Alloy Steel Bars

(F.o.b. makers' mill)

Alloy Quantity Bar Base, 2.65c. per Lb.

S.A.E. Series Numbers		Alloy Differential
2000	(½% Nickel)	$0.25
2100	(1½% Nickel)	0.55
2300	(3½% Nickel)	1.50
2500	(5% Nickel)	2.25
3100	Nickel Chromium	0.55
3200	Nickel Chromium	1.35
3300	Nickel Chromium	3.80
3400	Nickel Chromium	3.20
4100	Chromium Molybdenum (0.15 to 0.25 Molybdenum)	0.50
4100	Chromium Molybdenum (0.25 to 0.40 Molybdenum)	0.70
4600	Nickel Molybdenum (0.20 to 0.30 Molybdenum, 1.25 to 1.75 Nickel)	1.05
5100	Chromium Steel (0.60 to 0.90 Chromium)	0.35
5100	Chromium Steel (0.80 to 1.10 Chromium)	0.45
5100	Chromium Spring Steel	0.20
6100	Chromium Vanadium Bars	1.20
6100	Chromium Vanadium Spring Steel	0.95
9250	Silicon Manganese Spring Steel (flats)	0.25
	Rounds and squares	0.50
	Chromium Nickel Vanadium	1.50
	Carbon Vanadium	0.95

Above prices are for hot rolled steel bars, forging quality. The differential for cold-drawn bars is ¾c. a lb. higher, with standard classification for cold-finished alloy steel bars applying. For billets 4 x 4 to 10 x 10 in., the price for a gross ton is the net price for bars of the same analysis.

Billets under 4 x 4 in. carry the steel bar base. Slabs with a sectional area of 16 in. or over carry the billet price. Slabs with sectional area of less than 16 in. or less than 2½ in. thick, regardless of sectional area, take the bar price.

Rails

	Per Gross Ton
Standard, f.o.b. mill	$43.00
Light (from billets), f.o.b. mill	36.00
Light (from rail steel), f.o.b. mill	34.00
Light (from billets), f.o.b. Ch'go mill	36.00

Track Equipment

	Base per 100 Lb.
Spikes, ⅝ in. and larger	$2.80
Spikes, ½ in. and smaller	2.80
Spikes, boat and barge	3.00
Tie plate, steel	2.07½
Angle bars	$2.75
Track bolts, to steam railroads	$3.80 to 4.00
Track bolts, to jobbers, all sizes, per 100 count	70 per cent off list

Welded Pipe

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills

Butt Weld

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
⅛	45	19½	¼ and ⅜	+11	+36
¼ to ⅜	51	25½	½	23	5
½	56	42½	¾	28	11
¾	60	48½	1 and 1¼	31	15
1 to 3	62	50½	1½ and 2	35	18

Lap Weld

2	55	43½	2	23	9
2½ to 6	59	47½	2½ to 3½	28	13
7 and 8	56	43½	4 to 6	30	17
9 and 10	54	41½	7 and 8	29	16
11 and 12	53	40½	9 to 12	26	11

Butt Weld, extra strong, plain ends

⅛	41	24½	¼ and ⅜	+13	+48
¼ to ⅜	47	30½	½	23	7
½	53	42½	¾	28	12
¾	58	47½	1 to 2	34	18
1 to 1½	60	49½			
2 to 3	61	50½			

Lap Weld, extra strong, plain ends

2	53	42½	2	29	13
2½ to 4	57	46½	2½ to 4	34	20
4½ to 6	56	45½	4½ to 6	33	19
7 to 8	52	39½	7 and 8	31	17
9 and 10	45	32½	9 to 12	21	8
11 and 12	44	31½			

On carloads the above discounts on steel pipe are increased on black by one point, with supplementary discount of 5%, and on galvanized by 1½ points, with supplementary discount of 5%. On iron pipe, both black and galvanized, the above discounts are increased to jobbers by one point with supplementary discounts of 5 and 2½%.

Note.—Chicago district mills have a base two points less than the above discounts. Chicago delivered base is 2½ points less. Freight is figured from Pittsburgh, Lorain, Ohio, and Chicago district mills, the billing being from the point producing the lowest price to destination.

Boiler Tubes

Base Discounts, f.o.b. Pittsburgh

Steel		Charcoal Iron	
2 in. and 2¼ in.	38	1½ in.	1
2½ in.—2¾ in.	46	1¾ in.	8
3 in.	52	2 in.—2¼ in.	13
3¼ in.—3¾ in.	54	2½ in.—2¾ in.	16
4 in.	57	3 in.	17
4½ in. to 6 in.	46	3¼ in. to 3½ in.	18
		4 in.	20
		4½ in.	21

On lots of a carload or more, the above base discounts are subject to a preferential of two fives on steel and of 10 per cent on charcoal iron tubes. Smaller quantities are subject to the following modifications from the base discounts:

Lap Welded Steel—Under 10,000 lb., 6 points under base and one five; 10,000 lb. to carload, 4 points under base and two fives. Charcoal Iron—Under 10,000 lb., 2 points under base; 10,000 lb. to carload, base and one five.

Standard Commercial Seamless Boiler Tubes

Cold Drawn

1 in.	61	3 in.	46
1¼ to 1½ in.	53	3¼ to 3½ in.	48
1¾ in.	37	4 in.	51
2 to 2¼ in.	32	4½, 5 and 6 in.	40
2½ to 2¾ in.	40		

Hot Rolled

2 and 2¼ in.	38	3¼ to 3½ in.	54
2½ and 2¾ in.	46	4 in.	57
3 in.	52	4½, 5 and 6 in.	46

Beyond the above base discounts a preferential discount of 5 per cent is allowed on carload lots. On less than carloads to 10,000 lb., base discounts are reduced 4 points with 5 per cent preferential; on less than 10,000 lb., base discounts are reduced 6 points, with no preferential. No extra for lengths up to and including 24 ft. Sizes smaller than 1 in. and lighter than standard gages take the mechanical tube list and discounts. Intermediate sizes and gages not listed take price of next larger outside diameter and heavier gage.

Seamless Mechanical Tubing

	Per Cent Off List
Carbon, 0.10% to 0.30% base (carloads)	55
Carbon, 0.30% to 0.40% base	50

Plus differentials for lengths over 18 ft. and for commercial exact lengths. Warehouse discounts on small lots are less than the above.

and the movement is in reduced proportions as compared with usual activity at this time of the year.

Sheets.—Specifications are coming in at a fair rate, but are not well distributed among various mills nor among the leading consuming industries. A few automobile manufacturers have increased their requirements rather sharply for April, but others are still buying very closely. The Ford and Chevrolet companies are still accounting for a far larger percentage of current shipments to the automobile industry than they usually do. Demand for sheet steel from the building industry is showing improvement, but the usual spring activity in those lines seems to be delayed.

Prices are more clearly defined, although some shading is still reported on the common finishes of sheets when immediate rolling is in prospect. Even the larger mills are rather eager to get spot tonnage, but are adhering to the full quoted schedules on contract business. Efforts to get 2.75c. and 3.40c., Pittsburgh, on black and galvanized sheets, respectively, for second quarter have been discontinued, and the market has achieved a semblance of strength at 2.65c. and 3.30c. Light plates and blue annealed sheets are still quotable at 2.10c. and 2.25c., Pittsburgh, respectively, and jobbing mills are adhering to these schedules. The tendency to meet the prices of continuous units has been a little more pronounced.

Automobile body sheets are weaker, a 3.80c., Pittsburgh, price having become rather common in the last week. Sharp concessions from even this figure have been made in the Detroit territory recently, and the 3.90c. price, which has been in effect for several weeks, no longer applies to much tonnage. Metal furniture sheets are quotable at 3.90c. to 4c., with rather light demand.

The sheet industry is operating at about 70 per cent of capacity, and possibly lower, on account of curtailed activity in the Valleys and the Ohio River district.

Tin Plate.—Operations have not changed materially in the last week, although the tendency is still upward. The leading interest is running at 80 to 85 per cent of capacity, and, with several large independents scheduled on full turns, the average for the industry is easily up to the higher figure. Little change in the situation is expected for several weeks, when crop reports are more definite.

Strip Steel.—Specifications for strip steel are slightly heavier with some makers than they were at the first of the month, but the improvement is by no means general. Demand for cold-rolled material is exceedingly light. Some producers feel that this is occasioned by curtailed use in the automobile industry this year, as many important model changes substituted other materials for cold-rolled strip.

Prices are weak. The general quotation is still 2.65c., Pittsburgh, but 2.55c. applies to a far larger tonnage. Rolling schedules on hot-rolled material are a shade higher than they were last week, but may decline before the end of the period. The present average is about 50 per cent of capacity. Prices lack strength, but are not quotably lower than 1.75c., Pittsburgh, on material wider than 6 in. and 1.85c. on the narrower widths.

Cold-Finished Steel Bars.—Business shows signs of improvement with some makers, although increased demand is by no means impressive. The automobile industry is taking bars at about the same rate, with demand from other consuming industries a bit better and more diversified. Second quarter contracts are being taken at 2.10c., Pittsburgh, and the price is subject to little or no pressure.

Coke.—Demand for furnace coke is light, but there is some activity in future contracting. The Donner Steel Co., Buffalo, has inquired for its second quarter requirements of 6000 to 8000 tons monthly. Other inquiries are coming chiefly from gas companies. On spot business the $2.60, Connellsville, price is holding. Foundry coke is quiet. Second quarter contracting is developing few price irregularities, at least on the premium brands. Domestic coke is dull, but the coal market has a better tone with the approach of the opening of navigation on the Great Lakes.

Old Material.—The scrap market has a weaker tone, and, in the absence of consumer purchases, No. 1 heavy melting steel is nominally quotable this week at $16 to $16.50, a decline of 25c. a ton. It is not likely that dealers would sell the best grades of railroad and industrial scrap even at the higher figure, but mills show no disposition to buy and shipments have been held up until April 15 at one point. Other consumers are taking scrap in limited volume, and shipments to one or two important consuming points are confined largely to yard material.

Hydraulic compressed sheets are also weaker, although as much as $16, delivered Pittsburgh, has recently been paid in Detroit for car numbers to be shipped before April 1. On advance automobile lists, dealers' buying prices in the Detroit district range from $15.50 to $15.75, delivered Pittsburgh, and the market here is quotable at $15.50 to $16. The blast furnace grades are weaker.

The regular monthly list of the Pennsylvania Railroad contains 48,700 tons. Bids will be opened April 2.

Warehouse Prices, f.o.b. Pittsburgh

	Base per Lb.
Plates	3.00c.
Structural shapes	3.00c.
Soft steel bars and small shapes	2.80c. to 2.90c.
Reinforcing steel bars	2.75c.
Cold-finished and screw stock—	
Rounds and hexagons	3.60c.
Squares and flats	4.10c.
Bands	3.25c.
Hoops	4.25c.
Black sheets (No. 24), 25 or more bundles	3.60c.
Galv. sheets (No. 24), 25 or more bundles	4.25c.
Light plates, blue annealed (No. 10), 1 to 24 plates	3.25c.
Blue annealed sheets (No. 13), 1 to 24 sheets	3.40c.
Galv. corrug. sheets (No. 28), per square	4.13c.
Spikes, large	3.40c.
Small	3.80c. to 5.25c.
Boat	3.80c.
Track bolts, all sizes, per 100 count,	60 per cent off list
Machine bolts, 100 count,	60 per cent off list
Carriage bolts, 100 count,	60 per cent off list
Nuts, all styles, 100 count,	60 per cent off list
Large rivets, base per 100 lb.	$3.50
Wire, black, soft ann'l'd, base per 100 lb	$2.75 to 2.85
Wire, galv. soft, base per 100 lb.	3.20 to 3.30
Common wire nails, per keg	2.60 to 2.75
Cement coated nails, per keg	2.65 to 2.80

Prices per gross ton delivered consumers' yards in Pittsburgh and points taking the Pittsburgh district freight rate:

Basic Open-Hearth Grades:	
No. 1 heavy melting steel	$16.00 to $16.50
No. 2 heavy melting steel	14.00 to 14.50
Scrap rails	15.00 to 15.50
Compressed sheet steel	15.50 to 16.00
Bundled sheets, sides and ends	14.00 to 14.50
Cast iron carwheels	14.50 to 15.00
Sheet bar crops, ordinary	18.00 to 18.50
Heavy breakable cast	12.00 to 13.00
No. 2 railroad wrought	16.00 to 16.50
Hvy. steel axle turnings	14.00 to 14.50
Machine shop turnings	10.75 to 11.25
Acid Open-Hearth Grades:	
Railr. knuckles and couplers	20.50 to 21.00
Railr. coil and leaf springs	20.50 to 21.00
Rolled steel wheels	20.50 to 21.00
Low phos. billet and bloom ends	21.50 to 22.50
Low phos. mill plates	20.50 to 21.50
Low phos. light grades	20.50 to 21.50
Low phos. sheet bar crops	21.00 to 22.00
Heavy steel axle turnings	14.00 to 14.50
Electric Furnace Grades:	
Low phos. punchings	19.50 to 20.00
Hvy. steel axle turnings	14.00 to 14.50
Blast Furnace Grades:	
Short shoveling steel turnings	11.00 to 11.50
Short mixed borings and turnings	11.00 to 11.50
Cast iron borings	11.00 to 11.50
Rolling Mill Grades:	
Steel car axles	20.50 to 21.50
Cupola Grades:	
No. 1 cast	14.00 to 15.00
Rails 3 ft. and under	18.50 to 19.50

New Blooming Mill of Gulf States Operating

The new 40-in. blooming mill of the Gulf States Steel Co., at Alabama City, Ala., was placed in operation on March 20. This replaces the 36-in. blooming mill, which had served since the plant was established. The new mill has capacity ample for all present requirements, together with requirements for the new plate and sheet mills under construction.

The United Engineering & Foundry Co., Pittsburgh, had the general contract for the new mill, and F. H. McGraw & Co. of New York were the construction engineers. The soaking pit was installed by the James G. Griswell Co., Pittsburgh. Westinghouse electrical equipment is used.

The blooming mill is the first to be completed under the company's new expansion program started last year. Work is about 85 per cent complete on the new 70-in. plate mill, and foundations are being placed for the new sheet mill.

Semi-Finished Steel, Raw Materials, Bolts and Rivets

Mill Prices of Semi-Finished Steel

Billets and Blooms

	Per Gross Ton
Rerolling, 4-in. and under 10-in. Pittsburgh	$33.00
Rerolling, 4-in. and under 10-in., Youngstown	33.00
Rerolling, 4-in. and under 10-in., Cleveland	33.00
Rerolling, 4-in. and under 10-in., Chicago	34.00
Forging quality, Pittsburgh	38.00

Sheet Bars

(Open Hearth or Bessemer)

	Per Gross Ton
Pittsburgh	$33.00
Youngstown	33.00
Cleveland	33.00

Slabs

(8 in. x 2 in. and under 10 in. x 10 in.)

	Per Gross Ton
Pittsburgh	$33.00
Youngstown	33.00
Cleveland	33.00

Skelp

(F.o.b. Pittsburgh or Youngstown)

	Per Lb.
Grooved	1.85c. to 1.90.c
Universal	1.85c. to 1.90c.
Sheared	1.85c. to 1.90c.

Wire Rods

(Common soft, base)

	Per Gross Ton
Pittsburgh	$38.00
Cleveland	38.00
Chicago	39.00

Prices of Raw Material

Ores

Lake Superior Ores, Delivered Lower Lake Ports

	Per Gross Ton
Old range Bessemer, 51.50% iron	$4.80
Old range non-Bessemer, 51.50% iron	4.65
Mesabi Bessemer, 51.50% iron	4.65
Mesabi non-Bessemer, 51.50% iron	4.50
High phosphorus, 51.50% iron	4.40

Foreign Ore, c.i.f. Philadelphia or Baltimore

	Per Unit
Iron ore, low phos., copper free, 55 to 58% iron in dry Spanish or Algerian	12.00c.
Iron ore, low phos., Swedish, average 68% iron	12.00c.
Iron ore, basic Swedish, average 65% iron	10.00c.
Manganese ore, washed 52% manganese, from the Caucasus	30.00c.
Manganese ore, Brazilian, African or Indian, basic 50%	30.00c.
Tungsten ore, high grade, per unit, in 60% concentrates	$14.50 to $15.50

	Per Gross Ton
Chrome ore, 45 to 50% Cr_2O_3, crude, c.i.f. Atlantic seaboard	$22.00 to $24.00

	Per Lb.
Molybdenum ore, 85% concentrates of MoS_2, delivered	50c. to 55c.

Coke

	Per Net Ton
Furnace f.o.b. Connellsville prompt	$2.60
Foundry, f.o.b. Connellsville prompt	$3.50 to 4.75
Foundry, by-product, Ch'go ovens	8.00
Foundry, by-product, New England, del'd	11.00
Foundry, by-product, Newark or Jersey City, delivered	9.00 to 9.40
Foundry, by-product, Phila.	9.00
Foundry, Birmingham	5.00
Foundry, by-product, St. Louis, f.o.b. ovens	8.00
Foundry by-prod., del'd St. Louis	9.00

Coal

	Per Net Ton
Mine run steam coal, f.o.b. W. Pa. mines	$1.25 to $1.75
Mine run coking coal, f.o.b. W. Pa. mines	1.50 to 1.75
Gas coal, ¾-in. f.o.b. Pa. mines	1.90 to 2.00
Mine run gas coal, f.o.b. Pa. mines	1.65 to 1.75
Steam slack, f.o.b. W. Pa. mines	80c. to 90c.
Gas slack, f.o.b. W. Pa. mines	1.00 to 1.10

Ferromanganese

	Per Gross Ton
Domestic, 80%, seaboard	$94.00 to $99.00
Foreign, 80%, Atlantic or Gulf port, duty paid	94.00 to 99.00

Spiegeleisen

	Per Gross Ton Furnace
Domestic, 19 to 21%	$31.00 to $34.00
Domestic, 16 to 19%	29.00 to 32.00

Electric Ferrosilicon

	Per Gross Ton Delivered
50%	$83.50
75%	130.00

	Per Gross Ton Furnace		Per Gross Ton Furnace
10%	$35.00	12%	$39.00
11%	37.00	14 to 16%	45.00

Bessemer Ferrosilicon

F.o.b. Jackson County, Ohio, Furnace

	Per Gross Ton		Per Gross Ton
10%	$30.00	12%	$34.00
11%	32.00		

Silvery Iron

F.o.b. Jackson County, Ohio, Furnace

	Per Gross Ton		Per Gross Ton
6%	$22.00 to $23.00	10%	$26.00 to $28.00
7%	23.00 to 24.00	11%	28.00 to 30.00
8%	24.00 to 25.00	12%	30.00 to 32.00
9%	25.00 to 26.00		

Other Ferroalloys

Ferrotungsten, per lb. contained metal del'd	$1.40 to $1.50
Ferrochromium, 4 to 6% carbon and up, 65 to 70% Cr., per lb. contained Cr. delivered, in carloads	11.00c.
Ferrovanadium, per lb. contained vanadium, f.o.b. furnace	$3.15 to $3.65
Ferrocarbontitanium, 15 to 18%, per net ton, f.o.b. furnace, in carloads	$160.00
Ferrophosphorus, electric or blast furnace material, in carloads, 18%, Rockdale, Tenn., base, per gross ton	$91.00
Ferrophosphorus, electric 24%, f.o.b. Anniston, Ala., per gross ton	$122.50

Fluxes and Refractories

Fluorspar

	Per Net Ton
Domestic, 85% and over calcium fluoride, not over 5% silicon, gravel, f.o.b. Illinois and Kentucky mines	$18.00
No. 2 lump, Illinois and Kentucky mines	20.00
Foreign, 85% calcium fluoride, not over 5% silica, c.i.f. Atlantic port, duty paid	$18.25 to 18.75
Domestic, No. 1 ground bulk, 95 to 98% calcium fluoride, not over 2½% silica, f.o.b. Illinois and Kentucky mines	32.50

Fire Clay Brick

	Per 1000 f.o.b. Works	
	High-Heat Duty Brick	Intermediate Heavy Duty Brick
Pennsylvania	$43.00 to $46.00	$35.00 to $38.00
Maryland	43.00 to 46.00	35.00 to 38.00
New Jersey	50.00 to 65.00	.....
Ohio	43.00 to 46.00	35.00 to 38.00
Kentucky	43.00 to 46.00	35.00 to 38.00
Missouri	43.00 to 46.00	35.00 to 38.00
Illinois	43.00 to 46.00	35.00 to 38.00
Ground fire clay, per ton	7.00	

Silica Brick

	Per 1000 f.o.b. Works
Pennsylvania	$43.00
Chicago	52.00
Birmingham	50.00
Silica clay, per ton	$8.50 to 10.00

Magnesite Brick

	Per Net Ton
Standard sizes, f.o.b. Baltimore and Chester, Pa.	$65.00
Grain magnesite, f.o.b. Baltimore and Chester, Pa.	40.00
Standard size	45.00

Chrome Brick

	Per Net Ton
Standard size	$45.00

Mill Prices of Bolts, Nuts, Rivets and Set Screws

Bolts and Nuts

Per 100 Pieces

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

	Per Cent Off List
†Machine bolts	70
†Carriage bolts	70
Lag bolts	70
Plow bolts, Nos. 1, 2, 3 and 7 heads	70
Hot-pressed nuts, blank or tapped, square	70
Hot-pressed nuts, blank or tapped, hexagons	70
C.p.c. and t. square or hex. nuts, blank or tapped	70
Washers*	7.00c. to 6.75c. per lb. off list

*F.o.b. Chicago, New York and Pittsburgh.
†Bolts with rolled thread up to and including ⅛ in. x 6 in. take 10 per cent lower list prices.

Bolts and Nuts

	Per Cent Off List
Semi-finished hexagon nuts	70
Semi-finished hexagon castellated nuts, S.A.E.	70
Stove bolts in packages, P'gh.	75, 20, 10 and 5
Stove bolts in packages, Chicago.	75, 20, 10 and 5
Stove bolts in packages, Cleveland.	75, 20, 10 and 5
Stove bolts in bulk, P'gh.	75, 20, 10, 5 and 2½
Stove bolts in bulk, Chicago.	75, 20, 10, 5 and 2½
Stove bolts in bulk, Cleveland.	75, 20, 10, 5 and 2½
Tire bolts	60, 5 and 5

Discounts of 70 per cent off on bolts and nuts applied on carload business. For less than carload orders discounts of 55, 60 per cent apply.

Large Rivets

(½-in. and larger)

	Base per 100 Lb.
F.o.b. Pittsburgh or Cleveland	$3.10
F.o.b. Chicago	3.20

Small Rivets

(⅞-in. and smaller)

	Per Cent Off List
F.o.b. Pittsburgh	70 and 10
F.o.b. Cleveland	70 and 10
F.o.b. Chicago	70 and 10

Cap and Set Screws

(Freight allowed up to but not exceeding 50c. per 100 lb. on lots of 200 lb. or more)

	Per Cent Off List
Mille' cap screws	80, 10 and 5
Milled standard set screws, case hardened,	80 and 5
Milled headless set screws, cut thread	75 and 10
Upset hex. head cap screws, U.S.S. thread,	85 and 10
Upset hex. cap screws, S.A.E. thread	85 and 10
Upset set screws	80, 10 and 5
Milled studs	70

Chicago

Pipe Lines Bring Orders for 100,000 Tons of Steel—Plates and Shapes Decline $1 a Ton

CHICAGO, March 25.—A feature of this market is the placing of orders for oil and gas lines which in the aggregate call for about 100,000 tons of plates. Orders have been entered at mills with shipping instructions which assure heavy plate mill operations during the next six to seven weeks. The extension of existing gas lines and the planning of new projects seem now to assure a substantial volume of plate business for many months.

New buying except in plates has been rather light in the past week, while on the other hand specifications for finished steel are in ample volume to assure ingot output at the average of recent weeks.

More disturbing to producers than current business is the uncertainty of the price structure. Notwithstanding the impulse given to the plate market by recent large orders, prices have dropped $1 a ton at Chicago. Competition for structural business is unusually keen, and prices for shapes are now quotable at 1.90c. a lb. in tonnage lots.

The possibility of advances in prices for sheets seems more remote in view of the unsteadiness of current quotations. Cold-rolled strip prices have sagged $2 a ton, as some producers attempt to widen markets in the absence of volume business from manufacturers of automobiles. Hot-rolled strips, for which demand is spotty and relatively small in the aggregate, also are moving to lower price levels.

More encouraging than the price picture of the local market are reports that the Illinois Central, Union Pacific and the Chicago & North Western, among the Western railroads, and the New York Central and the Pennsylvania, in the East, are soon to inquire for cars.

Local pig iron interests sense heavier shipments in April to automobile manufacturers. It is reported that builders of heavy tractors are soon to go on lighter schedules and that tillage machinery production programs are nearing an end, but that heavy schedules are being planned for the output of harvesting machinery.

The Pacific Gas & Electric Co. has placed 4000 tons of steel pipe for Tiger Creek power house with Western Pipe & Steel Co. and the M. W. Kellogg Co.

Ferroalloys.—Sales are unusually light. Quotations are unchanged.

Pig Iron.—Sales of Northern foundry iron are the heaviest for any week so far this year, and in the meantime shipments gain slowly but steadily, so that indications are now that deliveries in March will average about 10 per cent above those of the previous month. Inquiries reaching sellers indicate that the melt by automobile manufacturers will show a satisfactory increase in the coming month.

The Allis-Chalmers Mfg. Co., Milwaukee, has placed 5000 tons of foundry iron, 325 tons of Northern charcoal iron, 150 tons of Southern charcoal iron and 250 tons of 15 to 16 per cent silvery.

Prices for Chicago furnace iron are steady at $19.50 a ton, while boat iron taken from local docks is being sold at 50c. to $1 a ton below this figure. Small lots of Southern iron are moving at $13 a ton, Birmingham.

Interests selling charcoal iron are attempting to stabilize prices at $24 a ton, furnace, but the market is still influenced by lower prices quoted to regular users on tonnages which they will take over and above normal requirements.

Prices per gross ton at Chicago:

N'th'n No. 2 fdy., sil. 1.75 to 2.25	$19.50
N'th'n No. 1 fdy., sil. 2.25 to 2.75	20.00
Malleable, not over 2.25 sil	19.50
High phosphorus	19.50
Lake Super. charc'l, sil. 1.50	27.04
S'th'n No. 2 fdy. (all rail)	19.01
Low phos., sil. 1 to 2, copper free	29.50
Silvery, sil. 8 per cent	$28.79 to 29.79
Bess. ferrosilicon, 14-15 per cent	46.29

Prices are delivered consumers' yards except on Northern foundry, high phosphorus and malleable, which are f.o.b. local furnace, not including an average switching charge of 61c. per gross ton.

Bolts, Nuts and Rivets.—Specifications remain light, and there is reason to believe that total releases for March will not measure up to the volume in February. Production at farm machinery plants remains heavy, and it appears probable that the change from output of tillage equipment to harvesting machinery will not materially change the general level of operations.

Rails and Track Supplies.—The Western rail market is seasonably quiet. Rail mills are well scheduled and are probably having less trouble this year in meeting promises of delivery than has previously been the case in March. This is due to the fact that shipments against present contracts were started earlier than is usual and most railroads have been willing to extend deliveries through May and June.

There is a substantial volume of inquiry in the market for track supplies which will be needed in the second quarter. Shipments of iron tie plates are heavy. Both inquiries and orders for light rails are confined to miscellaneous lots of small size.

Prices f.o.b. mill, per gross ton: Standard section open-hearth and Bess. rails, $43; light rails, rolled from billets, $36. *Per lb.:* Standard railroad spikes, 2.80c.; track bolts with square nuts, 3.80c.; steel tie plates, 2.07½c. to 2.15c.; angle bars, 2.75c.

Cast Iron Pipe.—The past week has brought further improvement in the local cast iron pipe market. Inquiries are coming from a wider territory, and public utility companies are once again making known their needs. Prices remain moderately steady, though weakness is shown to the east of Chicago, where it is reported that French pipe is a market factor.

Detroit has distributed a large tonnage among four producers. The McWane Cast Iron Pipe Co. was given 30,000 ft. of 6-in., and the American Cast Iron Pipe Co. took 25,000 ft. of 8-in. The Lynchburg Foundry Co. and the United States Pipe & Foundry Co. also participated in the business. The McWane Cast Iron Pipe Co. has taken 100 tons of 2 to 8-in. pipe for Ridgeway, Iowa, and James B. Clow & Sons are low bidders at $44.95 a ton, delivered, on 500 tons of 6 to 24-in. pipe for Saginaw, Mich. The freight rate from Birmingham to Saginaw is $8.80 a ton.

Among fresh inquiries are 1000 tons of 16-in. pipe for Chicago; 3000 ft. of 6-in. pipe for Marshfield, Wis.; 12,700 ft. of 6 and 8-in. pipe for Whitefish Bay, Wis., and 150 tons for Seneca, Neb. Neenah, Wis., will close bids March 29 on 330 tons of 6 to 12-in. Class C pipe. Deliveries are prompt on most sizes.

Prices per net ton, deliv'd Chicago: Water pipe, 6-in. and over, $45.20 to $46.20; 4-in., $48.20 to $49.20; Class A and gas pipe, $3 extra.

Sheets.—Local producers continue to take orders at 2.80c. to 2.90c., Chicago, for black sheets; 3.45c. to 3.55c., for galvanized, and 2.25c. for No. 10 blue annealed sheets.

Consumers are displaying little interest in future needs and, though hot mills continue to produce at about 85 per cent of capacity, backlogs are very light, with the exception of those on blue annealed sheets. A fair tonnage of this grade taken at present prices will be carried over for delivery in the next quarter.

The situation as to order books is shown somewhat by deliveries, which range from 10 days to two weeks on galvanized and black sheets, while promises generally are about three weeks on the blue annealed product. Demand is more widespread than a week ago. Orders are coming in from a wide territory surrounding Chicago, and most users have need for sheets at this time. The roofing trade continues to gain momentum and orders from this source are heavier. Jobbers report distribution fair for this time of the year.

Base prices per lb., deliv'd from mill in Chicago: No. 24 black sheets, 2.80c. to 2.90c.; No. 24 galv., 3.45c. to 3.55c.; No. 10 blue ann'l'd, 2.25c. Deliv'd prices at other Western points are equal to the freight from Gary, plus the mill prices, which are 5c. per 100 lb. lower than Chicago delivered prices.

Reinforcing Bars.—Fresh inquiry continues to develop at a satisfactory rate, but even though much of the work now contemplated develops into contracts, it will be a number of weeks before bending shops feel the impulse. The outstanding award this week is 450 tons for a building for the Continental Can Co.

New business in early prospect calls for round tonnages for an office build-

ing at Springfield, Ill., a sewage disposal plant at Galesburg, Ill., and the development of the outer drive at the mouth of the Chicago River. State road work will soon put large tonnages in shops. Illinois will open bids near the end of the month on 300 miles of highway requiring 3000 tons of reinforcing bars. Indiana's program also is impressive. Published prices which were withdrawn a week ago are reported to have been reinstated.

Wire Products.—Spring weather has stimulated distribution by jobbers, but the total volume has made only a slight change in operations, which stand at 55 per cent of capacity. The price structure appears to be on a better footing both geographically and as to product. Specifications from the manufacturing trade, though in fair volume, are not expanding as is usually the case at this time of the year.

Cold-Rolled Strip.—Prices have given way $2 a ton to a range of 2.55c. to 2.65c. a lb., Cleveland. Present delivered prices at Chicago are 2.85c. to 2.95c. Demand is a trifle broader, but operations remain at about 40 per cent.

Bars.—Agricultural implement manufacturers are making heavier use of bars, as production is being brought to higher levels. This is especially noticeable in forging bars. Specifications for mild steel bars are fully equal to shipments and new buying is in fair volume. The bulk of users are placing orders at close range at 1.95c. a lb., Chicago.

The iron bar market is quiet, and quotations are steady at 1.95c., Chicago. The agricultural implements manufacturers are making larger use of alloy bars, and their needs are an important factor in sustaining output in the range of 55 to 60 per cent of capacity. Demand for rail steel bars is spotty and interest in second quarter contracts is dull. Prices are steady at 1.85c. a lb., Chicago Heights.

Warehouse Prices, f.o.b. Chicago

	Base per Lb.
Plates and structural shapes	3.10c.
Soft steel bars	3.00c.
Reinforc'g bars, billet steel—	
Under 5 tons	2.85c.
5 tons to 30 tons	2.45c.
30 tons and over	2.00c.
Rail steel reinforcement	1.75c.
Cold-fin. steel bars and shafting—	
Rounds and hexagons	3.60c.
Flats and squares	4.10c.
Bands (¼ in. in Nos. 10 and 12 gages)	3.20c.
Hoops (No. 14 gage and lighter)	3.75c.
Black sheets (No. 24)	4.05c.
Galv. sheets (No. 24)	4.60c.
Blue ann'l'd sheets (No. 10)	3.35c.
Spikes, ½ in. and larger	3.55c.
Track bolts	4.55c.
Rivets, structural	4.00c.
Rivets, boiler	4.00c.
	Per Cent Off List
Machine bolts	60
Carriage bolts	60
Coach or lag screws	60
Hot-pressed nuts, sq., tap. or blank	60
Hot-pressed nuts, hex., tap. or blank	60
No. 8 black ann'l'd wire, per 100 lb.	$3.45
Com. wire nails, base per keg	$2.85 to 2.95
Cement c't'd nails, base per keg	2.85 to 2.95

Structural Material.—Producers' efforts to hold tonnage prices at 1.95c. a lb., Chicago, have failed, and the generally recognized quotation now is 1.90c. for attractive business. The local market is not as active as a week ago, but the outlook for the near future appears to be fair. The Morrison Hotel addition in Chicago may be awarded this week. This project calls for 4000 tons of steel.

It is reported from Milwaukee that building permits in February were 81 per cent larger than in the second month last year and that February of this year topped the preceding month by 188 per cent.

Plates.—This market is facing a situation wherein prices are off $1 a ton at a time when new tonnages are the most impressive of the year.

The A. O. Smith Corporation, Milwaukee, has placed 60,000 tons of plates with Chicago producers for a 24-in. gas line which will extend from Texas to Omaha. Orders have been scheduled to be run over the next seven weeks. This line, which is to be somewhat over 300 miles long, brings the total of line pipe on which the Milwaukee fabricator is working to about 800 miles. Final arrangements are still uncompleted on the gas line to Chicago. It is thought by some that this project, which calls for 250,000 tons, may still be some distance in the future.

Orders for oil storage tanks have resulted in the placing of 3300 tons of plates with Western mills.

Old Material.—After several weeks of steadiness in iron and steel scrap prices, lower quotations have been made on most of the heavy tonnage grades. A large consumer has bought a tonnage of heavy melting steel at $13.50 a ton, delivered, and dealers have lowered their maximum offering price to $13.25 a ton. Incoming shipments of this grade are large, but, as mills are working at near capacity, there has been no troublesome distress tonnage.

A round tonnage of rolled steel wheels has moved to a melter at 50c. a ton below the price of a week ago. Offerings of short rails appear to be in larger tonnage than the market will absorb, and distress lots are an important factor at this time. This situation has led to lower prices, especially for the 2-ft. lengths. Heavier engagement of industry is reflected in liberal shipments of borings, which, because of at least one hold-up order, are causing some trouble as they appear on track.

An exception to the general tendency in this market is noted in the case of malleable scrap. Demand is moderately brisk and the supply is none too liberal, with the result that prices are strong.

A major influence in the market is the weather, which is favorable for gathering and preparation of scrap. Railroads are shipping promptly, and larger quantities are moving in here from the North and Northwest. Among railroad offerings are 7500 tons by the Milwaukee Road and 1000 tons by the Nickel Plate.

Prices deliv'd Chicago district consumers:

	Per Gross Ton
Basic Open-Hearth Grades:	
Heavy melting steel	$13.00 to $13.50
Shoveling steel	13.00 to 13.50
Frogs, switches and guards, cut apart, and misc. rails	13.75 to 14.25
Hydraul. compressed sheets	11.75 to 12.25
Drop forge flashings	9.75 to 10.25
No. 1 busheling	11.00 to 11.50
Forg'd cast and r'l'd steel carwheels	17.00 to 17.50
Railroad tires, charg. box size	17.50 to 18.00
Railroad leaf springs cut apart	17.50 to 18.00
Acid Open-Hearth Grades:	
Steel couplers and knuckles	15.50 to 16.00
Coil springs	18.00 to 18.50
Electric Furnace Grades:	
Axle turnings	12.50 to 13.00
Low phos. punchings	15.25 to 15.75
Low phos. plates, 12 in. and under	14.75 to 15.25
Blast Furnace Grades:	
Axle turnings	10.50 to 11.00
Cast iron borings	9.50 to 10.00
Short shoveling turnings	9.50 to 10.00
Machine shop turnings	7.50 to 8.00
Rolling Mill Grades:	
Iron rails	14.00 to 14.50
Rerolling rails	15.00 to 15.50
Cupola Grades:	
Steel rails less than 3 ft.	16.50 to 17.00
Steel rails less than 2 ft.	17.00 to 17.50
Angle bars, steel	15.00 to 15.50
Cast iron carwheels	14.50 to 15.00
Malleable Grades:	
Railroad	16.75 to 17.25
Agricultural	15.00 to 15.50
Miscellaneous:	
*Relaying rails, 56 to 60 lb.	23.00 to 25.00
*Relaying rails, 65 lb. and heav.	26.00 to 31.00
	Per Net Ton
Rolling Mill Grades:	
Iron angle and splice bars	14.50 to 15.00
Iron arch bars and transoms	16.50 to 17.00
Iron car axles	25.00 to 25.50
Steel car axles	16.00 to 16.50
No. 1 railroad wrought	12.25 to 12.75
No. 2 railroad wrought	11.75 to 12.25
No. 1 busheling	9.00 to 9.50
No. 2 busheling	7.25 to 7.75
Locomotive tires, smooth	14.50 to 15.00
Pipes and flues	9.25 to 9.75
Cupola Grades:	
No. 1 machinery cast	13.75 to 14.25
No. 1 railroad cast	13.25 to 13.75
No. 1 agricultural cast	11.75 to 12.25
Stove plate	11.00 to 11.50
Grate bars	11.00 to 11.50
Brake shoes	11.00 to 11.50

*Relaying rails, including angle bars to match, are quoted f.o.b. dealers' yards.

Merger of Screw and Bolt Companies Approved

Consolidation of the Cleveland Wrought Products Co., Cleveland, and the Chicago Nut Mfg. Co., Chicago, was approved by the stockholders of both companies at meetings held March 20. The new company formed by the merger will be known as the United Screw & Bolt Corporation. C. L. Wasmer, president of the Cleveland company, will be chairman, and E. A. Thatcher, president of the Chicago company, will be president of the new company. The capital will consist of 28,604 shares of Class A and 92,559 shares of Class B stock.

The Wrought Iron Co. of America, Lebanon, Pa., has entered into a contract with the Lloyd Forge Co., Annville, Pa., to act as selling agent for that company's entire output of turnbuckles.

New York

Little Evidence of Seasonal Gains in Steel Business but Pig Iron Sales Are Larger

NEW YORK, March 25.—Pig iron sales have shown another gain, totaling 16,000 tons, as compared with 13,000 last week and 10,000 tons the week before. More than 7000 tons of the week's total, however, was booked by one broker. Selling has been aggressive and many melters, wishing to take advantage of low prices, have placed at least part of their second quarter requirements. There has been no speculative buying, however. In fact, a definite upturn in general business would no doubt bring out many supplementary orders from melters who have bought, as well as a good volume of business from foundries that still have stock iron from last year or will carry over first quarter iron into the coming quarter.

Foundry melt is very spotty. Makers of cotton machinery in New England are operating their cupolas only one day a week. Foundries serving some of the machine tool builders are running only two or three days a week. Some of the jobbing foundries are busy and others are running at a very low rate.

Buffalo furnaces have taken the major share of the tonnage recently sold, and two Buffalo producers have announced price advances. Competition is still keen, however, with little variation from recently prevailing prices. Both Alabama and eastern Pennsylvania irons are actively figuring in current transactions.

The E. W. Bliss Co., Brooklyn, is in the market for 2000 tons of foundry iron, and the General Electric is inquiring for 2325 tons of iron, including 1100 tons of malleable for Elmira, N. Y., 200 tons of malleable and 250 tons of foundry for Lynn, Mass., 275 tons of foundry for Everett, Mass., 300 tons of foundry for Pittsfield, Mass., and 200 tons of foundry for Schenectady, N. Y. A manufacturer of household equipment has closed for 2000 tons.

Prices per gross ton, delivered New York district:

Buffalo No. 2 fdy., sil. 1.75 to 2.25	$20.91 to $21.41
*Buff. No. 2, del'd east. N. J.	19.28 to 19.78
East. Pa. No. 2 fdy., sil. 1.75 to 2.25	19.39 to 21.02
East. Pa. No. 2X fdy., sil. 2.25 to 2.75	19.89 to 21.52

Freight rates: $4.91 from Buffalo, $1.39 to $2.52 from eastern Pennsylvania.
*Prices delivered to New Jersey cities having rate of $3.28 a ton from Buffalo.

Warehouse Business.—Most jobbers in this district report continued improvement in buying. Demand for structural material is still small, with building activity slack. Zinc sheets from warehouse stocks have been reduced 50c. a ton to 10.25c. to 11c. per lb., base, in casks.

Cast Iron Pipe.—Inquiries are generally limited to small lots, in many instances a carload of pipe or less. Prices, however, continue firm. While freight rates on cast iron pipe were increased March 20, in interstate shipments, the intrastate tariff in New Jersey and in Alabama has been postponed by the Interstate Commerce Commission until June 30. Dedham, Mass., has closed on about 2000 tons of water pipe. Bloomfield, N. J., will open bids April 7 on about 200 tons of pipe.

Prices per net ton deliv'd New York: Water pipe, 6-in. and larger, $38.90 to $40.90; 4-in. and 5-in., $41.90 to $43.90; 3-in., $48.90 to $50.90. Class A and gas pipe, $3 extra.

Reinforcing Bars. — Sentiment is improving. Actual computation of shipments since the first of the year shows them not far behind those for the corresponding periods in 1929 and 1928. In the last 60 days sellers have quoted on more large projects in this territory than in any comparable period in the past five years. Much of this work is for State and local governments or for public utilities.

Demand for reinforcing steel for highways, which will set in about April 1, is expected to be in record-breaking volume. In fact, sellers anticipate that wire mesh capacity will be taxed, with purchases of bars expanded proportionately. The Concrete Steel Co. will supply over 3,000,000 ft. of mesh (800 tons) for the Empire State Building, New York. This is believed to be the largest building mesh order ever placed.

The American Can Co. has awarded 3000 tons for Chicago buildings, but has not yet disclosed the name of the successful bidder.

Reinforcing bars in 40, 50 and 60-ft. lengths for mill shipment are quoted at 1.85c. a lb., Pittsburgh. Warehouse prices range from 2.44c., f.o.b. cars, New York, for carloads or larger lots to 3.25c. for the smallest tonnages.

Finished Steel.—In some directions a slight improvement in steel business has developed within the past week, but most sellers are unable to detect any marked change in the volume of orders. Prospects appear somewhat better for building construction taking either structural steel or reinforcing bars, but the average of orders from general industrial consumers is not gaining enough to indicate that business is showing any seasonal upturn.

Prices are not gaining strength. In fact, the trend seems to be toward weakness, although many of the orders are too small to tempt mills to offer concessions. Eastern mills are quoting plates at 1.90c. to 1.95c., Coatesville, Pa., but occasional sales are being made at 1.85c. Prices on hot-rolled and cold-rolled strip steel have weakened, and blue annealed sheets are affected to such an extent by continuous mill competition that jobbing mills are quoting a variety of prices. It cannot be said that 2.10c. for No. 10 light plates and 2.25c. for No. 13 blue annealed sheets are firm. Mills making black and galvanized sheets are willing to enter second quarter contracts at 2.65c. for black and 3.30c. for galvanized, but the price on black is still subject to

Warehouse Prices, f.o.b. New York

	Base per Lb.
Plates and structural shapes	3.30c.
Soft steel bars, small shapes	3.25c.
Iron bars	3.24c.
Iron bars, Swed. charcoal	7.00c. to 7.25c.
Cold-fin. shafting and screw stock—	
Rounds and hexagons	3.40c.
Flats and squares	3.90c.
Cold-roll. strip, soft and quarter hard	5.05c.
Hoops	4.25c.
Bands	3.75c.
Blue ann'l'd sheets (No. 10)	3.60c.
Long terne sheets (No. 24)	5.80c.
Standard tool steel	12.00c.
Wire, black annealed	4.50c.
Wire, galv. annealed	5.15c.
Tire steel, ⅛ x ½ in. and larger	3.40c.
Smooth finish, 1 to 2½ x ¼ in. and larger	3.75c.
Open-hearth spring steel, bases	4.50c. to 7.00c.

	Per Cent Off List
Machine bolts, cut threads:	
¾ x 6 in. and smaller	60
1 x 30 in. and smaller	50 to 50 and 10
Carriage bolts, cut thread:	
½ x 6 in. and smaller	60
¾ x 20 in. and smaller	50 to 50 and 10
Coach Screws:	
½ x 6 in. and smaller	60
1 x 6 in. and smaller	50 to 50 and 10

Boiler Tubes—	Per 100 Ft.
Lap welded, 2-in.	$19.00
Seamless steel, 2-in.	20.25
Charcoal iron, 2-in.	26.25
Charcoal iron, 4-in.	67.00

Discounts on Welded Pipe

Standard Steel—	Black	Galv.
⅛-in. butt	46	29
¼-in. butt	51	37
1-3-in. butt	53	39
2½-6-in. lap	48	35
7 and 8-in. lap	44	17
11 and 12-in. lap	37	12
Wrought Iron—		
⅛-in. butt	5	+19
¼-in. butt	11	+ 9
1-1½-in. butt	14	+ 6
2-in. lap	5	+14
3-6-in. lap	11	+ 6
7-12-in. lap	3	+16

Tin Plate (14 x 20 in.)

	Prime	Seconds
Coke, 100 lb. base box	$6.45	$6.20
Charcoal, per Box—	A	AAA
IC	$9.70	$12.10
IX	12.00	14.25
IXX	13.90	16.00

Terne Plate (14 x 20 in.)

IC—20-lb. coating	$10.00 to $11.00
IC—30-lb. coating	12.00 to 13.00
IC—40-lb. coating	13.75 to 14.25

Sheets, Box Annealed—Black, C. R. One Pass

	Per Lb.
Nos. 18 to 20	3.60c. to 3.70c.
No. 22	3.75c. to 3.85c.
No. 24	3.80c. to 3.90c.
No. 26	3.90c. to 4.00c.
No. 28*	4.05c. to 4.15c.
No. 30	4.30c. to 4.40c.

Sheets, Galvanized

	Per Lb.
No. 14	3.90c. to 4.00c.
No. 16	3.75c. to 3.85c.
No. 18	3.90c. to 4.00c.
No. 20	4.00c. to 4.10c.
No. 22	4.10c. to 4.20c.
No. 24†	4.25c. to 4.35c.
No. 26	4.50c. to 4.60c.
No. 28*	4.75c. to 4.85c.
No. 30	5.15c. to 5.25c.

*No. 28 and lighter, 36 in. wide, 20c. higher per 100 lb.
†For 50 bundles or more, 25c. per 100 lb. or less.

concessions on lots for immediate specification.

Railroad equipment business is the dullest in more than a year. The number of freight cars on which awards are pending is only 750, and new inquiries, though expected, probably will not appear in volume until railroad car loadings show a substantial gain.

Mill prices per lb., deliv'd New York: Soft steel bars, 2.19c.; plates, 2.07½c. to 2.12½c.; structural shapes, 2.04½c. to 2.09½c.

Coke.—Furnace coke quotations continue to lack strength, ranging from $2.50 to $2.60 a net ton, Connellsville. Special brands of beehive foundry coke are unchanged at $4.85 per net ton, ovens, or $8.56, delivered to northern New Jersey, Jersey City and Newark, and $9.44 to New York and Brooklyn. By-product foundry coke is quoted at $9 to $9.40, Newark or Jersey City; $10.06, New York or Brooklyn.

Old Material.—The downward trend in the price of No. 1 heavy melting steel continues, and dealers have reduced buying prices 50c. a ton on shipments to eastern Pennsylvania mills, offering $14 a ton, delivered. No. 2 heavy melting steel is also weak, and brokers who were paying up to $13 a ton, delivered eastern Pennsylvania, a week ago are obtaining material at $12 a ton, delivered. Other grades show lack of strength, but transactions are limited to small lots.

Dealers' buying prices per gross ton, f.o.b. New York:

No. 1 heavy melting steel..		$10.50
Heavy melting steel (yard)	$7.75 to	8.50
No. 1 hvy. breakable cast..	9.25 to	10.00
Stove plate (steel works).		8.00
Locomotive grate bars....		8.00
Machine shop turnings....	7.00 to	7.50
Short shoveling turnings..	7.25 to	7.50
Cast borings (blast fur. or steel works).....	7.00 to	7.50
Mixed borings and turnings	6.50 to	7.25
Steel car axles	16.75 to	17.75
Iron car axles	20.50 to	21.00
Iron and steel pipe (1 in. dia., not under 2 ft. long)	9.25 to	9.75
Forge fire	8.50 to	9.00
No. 1 railroad wrought....	11.50 to	12.00
No. 1 yard wrought, long..	10.50 to	11.50
Rails for rolling.....	10.50 to	11.00
Stove plate (foundry)....	8.75 to	9.00
Malleable cast (railroad)..	12.00 to	12.50
Cast borings (chemical)..	9.50 to	10.00

Prices per gross ton, deliv'd local foundries:

No. 1 machry. cast.....	$15.00
No. 1 hvy. cast (columns, bldg. materials, etc.), cupola size.....	13.00
No. 2 cast (radiators, cast boilers, etc.)	12.50

Cleveland

No Marked Gain in Business—Prices Lower on Automobile Body Sheets and Hot-Rolled Strip

CLEVELAND, March 25.—Sentiment in the iron and steel industry has improved a little, but this has not been reflected in any marked gain in business, and the March volume will show little change from that done in February. Mills are getting a considerable number of orders, but they are mostly for small lots and only for early needs.

Releases for sheets by some of the automobile companies during the past 10 days permitted several of the sheet mills to increase operations this week and resulted in a better demand for semi-finished steel, enabling a local mill to put on two additional open-hearth furnaces. Ingot production has increased in Cleveland to about 75 per cent of capacity.

In the automotive industry, a few manufacturers have made a slight increase in production, but the opinion seems quite general that this industry as a whole will operate at close to its present rate through April. An improvement is looked for in May.

Some business has been closed for the second quarter either in new contracts or extensions of present contracts for steel bars, plates and shapes. However, consumers as a rule are not showing much interest in contracts. Conditions in metal-working industries in Cleveland show a slight improvement.

The price situation does not indicate strength. Automobile body sheets have been reduced $2 a ton and hot-rolled strip steel, which recently has exhibited weakness, is generally quoted $2 a ton lower than the recent regular prices. Irregularity has developed on fender stock. Present prices on semi-finished steel have been reestablished for the coming quarter.

Pig Iron.—The market showed an increase in activity the past week, during which Cleveland interests sold 40,000 tons in foundry and malleable iron. While several good-sized lots were placed for the second quarter, considerable of the business was in small lots for early shipment and not much tonnage was taken in the northern Ohio territory. Shipping orders show little change and the tonnage shipped in March will not be much greater than that moved in February. Very little new business is coming from automobile foundries. Some foundries specializing on motor car castings will carry considerable iron over into the second quarter.

Prices are well maintained at recent quotations. For outside shipment, malleable and foundry iron are quoted at $18 to $18.50, Cleveland, the lower price for shipment to points where freight has to be absorbed. For local delivery, the market is firm at $19, furnace. Quotations in northern Indiana are from $18.50 to $19, while in Michigan $19.50 is the ruling price.

Prices per gross ton at Cleveland:

N'th'n fdy., sil. 1.75 to 2.25	$19.50
S'th'n fdy., sil. 1.75 to 2.25	19.51
Malleable	19.50
Ohio silvery, 8 per cent...	28.00
Basic Valley furnace.....	18.50
Stand. low phos., Valley...	$26.50 to 27.00

Prices except on basic and low phosphorus are delivered Cleveland. Freight rates: 50c. from local furnaces; $3 from Jackson, Ohio; $6.01 from Birmingham.

Iron Ore.—Quotations on the inquiry from the Ford Motor Co. for its 1930 iron ore requirements have been made by producers, but no date has been set for closing bids and it may be a week or more before the market is established by the placing of the Ford or other business. Indications still point to the reestablishment of the 1929 prices.

The consumption of Lake Superior ore during February amounted to 4,062,331 tons, or 38,684 tons less than during the longer previous month. The amount consumed in February last year was 4,818,811 tons. Furnace stocks March 1 were 23,939,463 tons, and the amount at furnaces and Lake Erie docks on that date was 29,475,298 tons, or upward of 4,000,000 tons more than on the same date a year ago when the amount at furnaces and docks was 25,414,351 tons. There were 160 furnaces in blast using Lake ore Feb. 28, a gain of five for the month. Central district furnaces consumed during February 1,956,904 tons of ore, an increase of 17,690 tons, and all-rail furnaces consumed 91,063 tons, a gain of 3182 tons. Lake front furnaces melted 1,903,853 tons, a decrease of 45,867 tons, and Eastern furnaces used 110,511 tons, a decrease of 13,689 tons.

Coke.—Demand for foundry coke continues rather quiet, and business this month with some producers is not holding up in volume to that in February. The present price of $8.25, ovens, for Ohio by-product foundry coke has been reestablished for April shipment.

Strip Steel.—Prices on hot-rolled strip have given away to the extent of $2 a ton to 1.70c., Pittsburgh, for wide strip and 1.80c. for narrow, to large consumers. This concession was first made to large users in the automotive industry after some mills had closed contracts at 1.80c. and 1.90c. Not all mills are making the reduction. The higher prices are still quoted for small lots. Specifications show little, if any, improvement. Cold-rolled strip is inactive. Some mills continue to quote this at 2.65c., Cleveland, but no sales have been made recently in large enough lots to test the price.

Semi-finished Steel.—The local producer has reaffirmed for the second

Warehouse Prices, f.o.b. Cleveland

	Base per Lb.
Plates and struc. shapes.....	3.00c.
Soft steel bars.....	3.00c.
Reinforc. steel bars.....2.25c. to	2.50c.
Cold-fin. rounds and hex.....	3.65c.
Cold-fin. flats and sq.....	4.15c.
Hoops and bands, No. 12 to ¼ in., inclusive	3.25c.
Hoops and bands, No. 13 and lighter	3.65c.
Cold-finished strip.....*	5.95c.
Black sheets (No. 24).....	3.75c.
Galvanized sheets (No. 24).....	4.50c.
Blue ann'l'd sheets (No. 10).....	3.25c.
No. 9 ann'l'd wire, per 100 lb.....	$2.75
No. 9 galv. wire, per 100 lb.....	3.20
Com. wire nails, base per keg.....	2.65

*Net base, including boxing and cutting to length.

quarter the present prices of $33, Cleveland, Youngstown and Pittsburgh, for sheet bars, billets and slabs for the second quarter. Specifications increased the past week and this producer has put on two additional open-hearth furnaces, now operating 11 of 14. With an enlargement of three of its furnaces, two to 200-ton capacity, its present output is what would have been 100 per cent before the enlargement.

Bolts, Nuts and Rivets.—The demand for bolts and nuts continues light, showing little change from the past few weeks. The industry is operating at about 60 per cent of capacity. Rivets are not active.

Bars, Plates and Shapes.—Business continues in rather moderate volume. While orders are fairly plentiful, they are for small lots and for early needs. The building field shows very little activity. Plate fabricators are figuring on more work than recently, resulting in an improvement in inquiry. An award of 1500 tons of welded steel pipe for Cleveland water pipe extensions has been made, and the Biggs Boiler Works, Akron, is scheduled to supply the pipe.

Steel bars are holding quite generally to 1.85c., Cleveland, although a concession to 1.80c. develops occasionally. Plates range from 1.80c. to 1.85c., Pittsburgh. Shapes are firmer than plates, holding to 1.85c. on most business. Second quarter contracts have been closed at 1.85c., Cleveland, for bars and at 1.85c., Pittsburgh, for plates and shapes.

Sheets.—Auto body sheets have declined $2 a ton to 3.80c., Pittsburgh, except possibly for small orders, and a moderate amount of business has been taken at the reduction. Black sheets are still quoted at 2.65c. and metal furniture sheets at 3.90c., efforts to advance these grades for the second quarter having about disappeared. Blue annealed sheets and light plates appear to be holding at 2.25c. and 2.10c. respectively. Quotations of 3.30c. on galvanized sheets for the second quarter have appeared.

Warehouse Prices, f.o.b. Philadelphia

	Base per Lb.
Plates, ¼-in. and heavier	2.70c.
Plates, ⅜-in.	2.90c.
Structural shapes	2.70c.
Soft steel bars, small shapes, iron bars (except bands)	2.80c.
Round-edge iron	3.50c.
Round-edge steel, iron finished 1½ x 1½ in.	3.50c.
Round-edge steel planished	4.30c.
Reinforc. steel bars, sq., twisted and deform.	2.60c. to 2.80c.
Cold-fin. steel, rounds and hex.	3.40c.
Cold-fin. steel, sq. and flats	3.90c.
Steel hoops	3.55c.
Steel bands, No. 12 to ⅜-in. inclus.	3.30c.
Spring steel	5.00c.
*Black sheets (No. 24)	3.80c.
†Galvanized sheets (No. 24)	4.45c.
Light plates, blue annealed (No. 10)	3.25c.
Blue ann'l'd sheets (No. 13)	3.40c.
Diam. pat. floor plates—	
¼-in.	5.30c.
⅜-in.	5.50c.
Rails	3.20c.
Swedish iron bars	6.60c.

*For 50 bundles or more; 10 to 49 bun., 4.10c. base; 1 to 9 bun., 4.35c. base.
†For 50 bundles or more; 10 to 49 bun., 4.95c. base; 1 to 9 bun., 5.30c. base.

While the recent spurt in orders has not been maintained, some producers have been able to increase operations this week. No interest is being shown in second quarter contracts.

Wire Products.—Demand continues light, but price shading is less in evidence than recently. Manufacturers' wire appears firm at 2.40c., Cleveland. Leading producers are adhering to $2.30 per keg on nails.

Old Material.—With no new demand from consumers and a further curtailment of shipments to the mills, the market is almost at a standstill and weak. Dealers are buying a little scrap for yard stocks, but are making practically no purchases against contracts, because of their inability to make shipments. Cast iron borings and mixed borings and short turnings have declined $1 a ton. The price on No. 2 busheling is nominal because local furnaces are not using that grade at present and dealers would not pay the quoted price for scrap to put in their yard stocks. Machine shop turnings have declined 50c. a ton, but the quotations on other steel-making grades are unchanged.

Prices per gross ton delivered consumers' yards:

Basic Open-Hearth Grades:	
No. 1 heavy melting steel	$13.25 to $13.75
No. 2 heavy melting steel	12.75 to 13.25
Compressed sheet steel	12.75 to 13.00
Light bundled sheet stampings	11.00 to 11.50
Drop forge flashings	11.50 to 11.75
Machine shop turnings	9.50 to 9.75
Short shoveling turnings	11.25 to 11.75
No. 1 railroad wrought	13.00 to 13.50
No. 2 railroad wrought	14.00 to 14.50
No. 1 busheling	12.00 to 12.50
Pipes and flues	9.00 to 9.50
Steel axle turnings	12.50 to 13.00
Acid Open-Hearth Grades:	
Low phos., forging crops	17.75 to 18.00
Low phos., billet bloom and slab crops	18.50 to 18.75
Low phos., sheet bar crops	18.00 to 18.50
Low phos., plate scrap	18.00 to 18.50
Blast Furnace Grades:	
Cast iron borings	9.50 to 9.75
Mixed borings and short turnings	9.50 to 9.75
No. 2 busheling	9.50 to 9.75
Cupola Grades:	
No. 1 cast	15.00 to 15.50
Railroad grate bars	11.00 to 12.00
Stove plate	12.00 to 12.50
Rails under 3 ft	18.50 to 19.50
Miscellaneous:	
Rails for rolling	16.25 to 16.50
Railroad malleable	16.00 to 16.50

Philadelphia

Operating Rates Maintained But Steel Prices Lack Firmness—Virginian Railway to Repair 1000 Cars

PHILADELPHIA, March 25.—Steel mill operations have receded no further this week, but prices lack firmness. An effort by an eastern Pennsylvania interest to advance black, galvanized and blue annealed sheet prices $2 a ton for second quarter has not been followed by other mills. With transactions in bars limited to small lots, prices are maintained, but plate quotations have been subject to occasional concessions of about $1 a ton, and 1.75c. a lb., nearby mill, for shapes is beginning to apply to smaller tonnages than formerly.

Consumers of pig iron and steel report some improvement in operating rates, but as yet have shown no inclination to anticipate requirements. Railroads are still among the more active buyers of steel. The Norfolk & Western opens bids tomorrow on 2500 tons of plates, shapes and bars for second quarter, and the Virginian Railway will shortly ask for bids on the repair of 1000 57-ton gondola cars, requiring 8000 to 10,000 tons of steel. The Newport News Shipbuilding & Dry Dock Co. has received an award of two ships.

Pig Iron.—Foundry iron prices lack strength, and the market in eastern Pennsylvania is generally settling to a basis of $19.50 a ton, except for occasional small lots, which still bring $20, base furnace. Southern pig iron is a factor, especially among consumers of sizable tonnages, such as manufacturers of soil and pressure pipe. Demand for low phosphorus iron is fair, although limited to small lots. Basic iron is quiet, except for the recent purchase of about 300 tons by a Trenton, N. J., consumer.

Prices per gross ton at Philadelphia:

East. Pa. No. 2, 1.75 to 2.25 sil.	$20.26 to $20.76
East. Pa. No. 2X, 2.25 to 2.75 sil.	20.76 to 21.26
East. Pa. No. 1X	21.26 to 21.76
Basic (del'd east. Pa.)	19.00 to 19.50
Malleable	21.25 to 21.75
Stand. low phos. (f.o.b. east. Pa. furnace)	24.00
Cop. b'r'g low phos. (f.o.b. furnace)	23.00 to 24.00
Va. No. 2 plain, 1.75 to 2.25 sil.	22.29
Va. No. 2X, 2.25 to 2.75 sil.	22.79

Prices, except as specified otherwise, are deliv'd Philadelphia. Freight rates: 76c. to $1.64 from eastern Pennsylvania furnaces; $4.54 from Virginia furnaces.

Bars.—Buying is limited to small lots, with 1.85c., Pittsburgh, or 2.17c., delivered Philadelphia, the usual quotation. The second quarter requirements of the Norfolk & Western Railroad include a small tonnage of bars.

Reinforcing Bars.—Some substantial tonnages of bars are included in projects not yet awarded, but most current construction requires lots of less than 100 tons. Prices are unchanged at 1.90c. to 1.95c., Pittsburgh, or 2.22c. to 2.27c., Philadelphia, for billet steel bars. Rail steel bars are quoted at about 1.75c., Franklin, Pa., and Tonawanda, N. Y., or 2.07c., delivered Philadelphia. The extra for cutting to length is not charged on rail steel bars and is usually omitted on billet steel bars.

Shapes.—Although shape mills are maintaining fair operating rates, the backlog of orders is in most cases decidedly small, and prices have shown a further tendency to settle to 1.75c. a lb., f.o.b. nearest mill to consumer, or 1.81c., Philadelphia, even for the smaller tonnages. A fair range of

the market, however, is 1.75c. to 1.80c., mill, or 1.81c. to 1.86c., delivered Philadelphia. Fabricators are in need of work, but are bidding on a slightly increased tonnage of new projects.

Plates. — Concessions from 1.90c., Coatesville, Pa., or 2c., delivered Philadelphia, have recently been granted on smaller tonnages than usual in previous weeks, so that 1.85c. to 1.90c., Coatesville, or 1.95c. to 2c., Philadelphia, is more representative of the present market. Orders on which the $1 a ton concession has recently applied have ranged from 50 to 300 tons. Some plate tonnage is in prospect from two ships recently awarded to the Newport News Shipbuilding & Dry Dock Co., and for repairs to 1000 gondola cars for the Virginian Railway. As many of the cars will require practically new bodies, it is estimated that 8000 to 10,000 tons of steel will be used.

Sheets. — An effort to advance prices on black, galvanized and blue annealed sheets $2 a ton for second quarter has apparently been unsuccessful, and mills are generally quoting black sheets at 2.65c., Pittsburgh, or 2.97c., Philadelphia, galvanized sheets at 3.30c., Pittsburgh, or 3.62c., Philadelphia, blue annealed sheets No. 13 gage at 2.25c., Pittsburgh, or 2.57c., Philadelphia, and blue annealed plates, No. 10 gage at 2.10c., Pittsburgh, or 2.42c., Philadelphia. On present small tonnage orders these prices are being maintained, but certain consumers, especially car builders, are more active and early inquiries for substantial tonnages are expected to provide a test of the market.

Imports.—In the week ended March 22, 3000 tons of chrome ore was received at this port from Portuguese Africa and a total of 2830 tons of pig iron, of which 1801 tons came from the United Kingdom, 928 tons from British India and 101 tons from the Netherlands. Steel imports consisted of 254 tons of steel strips from France, 32 tons of structural shapes from Germany and 11 tons of wire rods from Sweden.

Old Material.—Prices of all grades of scrap show a continued downward trend, especially No. 1 heavy melting steel, which has been bought at $14.50 a ton, delivered. A Coatesville, Pa., mill closed for upward of 10,000 tons and a Claymont, Del., consumer bought about 5000 tons. A small lot of No. 1 steel was offered to a consumer at Steelton, Pa., at $14.25 a ton, delivered, but not accepted. Blast furnace scrap has brought $10.50, delivered.

Prices per gross ton delivered consumers' yards, Philadelphia district:

No. 1 heavy melting steel..		$14.50
Scrap T rails		14.00
No. 2 heavy melting steel..	$11.50 to	12.50
No. 1 railroad wrought...	15.00 to	15.50
Bundled sheets (for steel works)		11.50
Hydraulic compressed, new	13.00 to	13.50
Hydraulic compressed, old.	12.00 to	13.00
Machine shop turnings (for steel works)		11.00
Heavy axle turnings (or equiv.)	12.50 to	13.50
Cast borings (for steel works and roll. mill)...	11.25 to	11.50
Heavy breakable cast (for steel works)	13.50 to	14.00
Railroad grate bars	11.50 to	12.00
Stove plate (for steel works)	11.50 to	12.00
No. 1 low phos., hvy., 0.04% and under	20.50 to	21.50
Couplers and knuckles	19.50 to	20.00
Rolled steel wheels	19.50 to	20.00
No. 1 blast f'nace scrap...		10.50
Wrot. iron and soft steel pipes and tubes (new specific.)		14.00
Shafting		19.00
Steel axles	21.00 to	21.50
No. 1 forge fire		13.00
Cast iron carwheels		15.00
No. 1 cast	15.00 to	15.50
Cast borings (for chem. plant)		14.00
Steel rails for rolling	15.00 to	15.50

Norton Co. Organizes British Subsidiary

The new English branch of the Norton Co., Worcester, Mass., has been organized as the Norton Grinding Wheel Co., Ltd. The company will have a capital of £200,000, which sum has been appropriated by the parent company for the purpose. The directors are W. La Coste Neilson, general sales manager of the Norton Co.; Herbert A. Stanton, the recently appointed European manager, and Frank A. Emery, assistant European manager, who has represented the company in London since 1921. Mr. Stanton will serve as managing director and secretary of the English company and Mr. Emery as treasurer and general manager.

Plans are completed for the English factory, which will be located at Welwyn Garden City, 21 miles northeast of London. It will have a floor area of about 136,000 sq. ft., which is about the size of the Norton plant in a suburb of Paris. Work of construction will begin in the immediate future. The equipment is being built at the Norton works in Worcester.

Waste Material Dealers Elect Officers

The seventeenth annual meeting and dinner of the National Association of Waste Material Dealers was held March 19, at the Hotel Astor, New York. Officers of the association for the coming year are: President, Carleton B. Overton, Castle & Overton, Inc., New York; first vice-president, George Birkenstein, S. Birkenstein & Sons, Chicago; second vice-president, R. W. Phillips, E. I. du Pont de Nemours & Co., Wilmington, Del.; and third vice-president, J. S. Katz, American Metal Co., New York. Charles M. Haskins continues as permanent secretary.

The retiring president of the association, Henry Lissberger, Federated Metals Corporation, New York, was unable to attend the meeting or the dinner in the evening because of the sudden death of his brother in Paris, and Charles M. Schwab, who had been scheduled to speak at the dinner as a guest of Mr. Lissberger, was also unable to be present.

Welders to Consider Some Architectural Problems

Tentative programs for the annual meeting of American Welding Society, to be held in New York, April 23 to 25, have been issued. Much attention will be given to structural welding, and a special session is being arranged for the benefit of architects and builders. In addition to the reports of researches by the structural steel welding committee, papers have been promised on the welding of beams to columns, beam to beam connections, and battledeck floors.

Other subjects to be considered are all-welded barges, construction of panel heating devices, tube turns, and education of welders.

Budd Shipments Increase

The Edward G. Budd Mfg. Co., Philadelphia, builder of steel automobile bodies, reports that shipments are now running at a rate which indicates an increase in March sales over February sales of close to $1,000,000. Unfilled customers' releases on hand at the beginning of March totaled more than $13,000,000, as compared with $8,000,000 a year ago.

Sheet & Tube Directors Again Confer

(*Concluded from page* 948)

Youngstown banks and personally in the entire community. I am opposed to this sale of Youngstown Sheet & Tube Co. because the deal is not fair to the stockholders and certainly not fair to the community in which I am so heavily interested.

"Let me make it very clear—and I say this with the greatest emphasis at my command—that I never contemplated merging Youngstown Sheet & Tube Co. and the Republic Steel Corporation. My vision was the diversification of Youngstown Sheet & Tube Co. through the acquisition of Inland Steel Co.

"Mr. Campbell can bring Inland into Sheet & Tube any day on fair terms. Inland would give him the required diversification in rails, heavy structural steel, shapes and so forth in a plant adjoining his Chicago property. Later, if conditions should be favorable, the Sheet & Tube-Inland combine could easily be enlarged with further diversification and advantageous geographic locations."

Pacific Coast

Orders for Structural Steel Plates and Cast Iron Pipe Gain —Building Activity More Pronounced

SAN FRANCISCO, March 22 (*By Air Mail*).—Activity in iron and steel products improved slightly during the week, and some large lots of cast iron pipe, plates and structural shapes were booked. The price structure appears to be on a somewhat firmer basis, though plate quotations continue weak.

Building and construction activity on the Pacific Coast is more pronounced, and a large number of new projects have recently come out for figures.

Pig Iron.—Several shipments of Indian foundry iron have recently arrived on the coast, part of the cargoes having been unloaded at Los Angeles and the balance at San Francisco. This material was applied against contracts placed some time ago. Another shipment of 1100 tons is due to arrive in Los Angeles about March 25. Part of this cargo will later be delivered to San Francisco district consumers. Prices are unchanged.

Prices per gross ton at San Francisco:

*Utah basic	$25.00 to $26.00
*Utah fdy., sil. 2.75 to 3.25	25.00 to 26.00
**Indian fdy., sil. 2.75 to 3.25	25.00 to 26.00

*Delivered San Francisco.
**Duty paid, f.o.b. cars San Francisco.

Bars.—Included among the larger awards of reinforcing steel bars were 350 tons for an immigrant station in Seattle, placed with the Pacific Coast Steel Corporation, and 312 tons for four bridges and highway work in San Joaquin County, Cal., secured by unnamed interests. Pending business involves a fair aggregate, including 1000 tons each for the Medical Arts Building, Tacoma, Wash., and the Naval Air Station at Pearl Harbor, Hawaii. Out-of-stock prices in the San Francisco district are firm at 2.30c., base, for carload lots. In the Los Angeles district quotations are $2 a ton higher. Merchant bars appear to be firm at 2.35c., c.i.f., though movement is restricted to unimportant tonnages.

Plates.—The Western Pipe & Steel Co. secured 3000 tons for a penstock for the Pacific Gas & Electric Co. at Tiger Creek, Cal., and the M. W. Kellogg Co. booked 1000 tons for two siphons for the same company at Tiger Creek. The Steel Tank & Pipe Co. took 250 tons for two 20,000 bbl. tanks for the Sunset Pacific Oil Co., Seattle. The Southern Pacific Co., San Francisco, placed 640 tons of abrasive plates with an unnamed Eastern mill. Most of pending business is confined to lots of less than 100 tons. The Sunset Pacific Oil Co. will take bids soon for three tanks totaling 50,000 bbl. and involving 250 tons of plates. Prices are weak at 2.20c., c.i.f.

Shapes. — The largest structural award of the week went to the Consolidated Steel Corporation and called for 550 tons for a building in Hollywood, Cal., for the Southern California Telephone Co. Dyer Brothers secured 230 tons for an addition to the State Building in San Francisco, and the McClintic-Marshall Co. booked 125 tons for a service station in Pasadena, Cal. Herrick Iron Works was low bidder on 242 tons for a transit shed in Oakland, and the Judson-Pacific Co. was low bidder on 350 tons for the Live Stock Building at Sacramento, Cal. The general contract for the Long Beach, Cal., auditorium has been awarded, and the subcontract for the steel is expected within the next 10 days. Shapes are firm at 2.35c., c.i.f.

Cast Iron Pipe.—Awards this week were the largest so far this year, totaling more than 7500 tons. Los Angeles placed 763 tons of 6-in. Class 150 pipe, under specification No. 1304, with the Pacific States Cast Iron Pipe Co. The same city, under specification No. 1303, awarded 1118 tons of 6 to 12-in. pipe to the United States Pipe & Foundry Co.; 100 tons of 6-in. to the Pacific States Cast Iron Pipe Co.; 508 tons of 8-in. to the National Cast Iron Pipe Co., and 836 tons of 8-in. pipe to the American Cast Iron Pipe Co. Portland, Ore., awarded 879 tons of 8 and 12-in. Class 150 pipe and 2550 tons of 20 to 30-in. Class B pipe to the United States Pipe & Foundry Co. and 40 tons of 4 and 6-in. Class 150 pipe to the Pacific States Cast Iron Pipe Co. Unnamed interests took a total of 505 tons of various sizes of pipe for Seattle.

Bids were opened on 1816 tons of 6 to 24-in. Class B and C pipe for Pasadena, Cal. San Diego will buy 113 tons of 10-in. Class 150 pipe. Bids will be opened on March 31 for 617 tons of 4 to 12-in. pipe for Santa Ana, Cal. Chehalis, Wash., will open bids on March 24 for 108 tons of 4 to 8-in. Class 150 pipe.

Steel Pipe.—Los Angeles has opened bids on 154 tons of 1 to 4-in. standard pipe, and Richmond, B. C., has awarded 2000 tons of steel pipe to an unnamed British interest. Little or no improvement is noted in demand for oil country goods.

Railroad Material.—Bids will be opened March 31 for 200 rolled steel car wheels for the San Francisco Municipal Railroad.

Warehouse Prices, f.o.b. San Francisco

	Base per Lb.
Plates and struc. shapes	3.30c.
Soft steel bars	3.30c.
Small angles, ⅞-in. and over	3.15c.
Small angles, under ⅞-in.	3.55c.
Small channels and tees, ¾-in. to 2¾-in.	3.75c.
Spring steel, ¼-in. and thicker	5.00c.
Black sheets (No. 24)	4.90c.
Blue ann'l'd sheets (No. 10)	3.90c.
Galv. sheets (No. 24)	5.30c.
Struc. rivets, ½-in. and larger	5.65c.
Com. wire nails, base per keg	$3.40
Cement c't'd nails, 100 lb. keg	3.40

Birmingham

Pig Iron Buying for Second Quarter Larger Than for First —Cast Iron Pipe More Active

BIRMINGHAM, March 25.—Pig iron buying tapered off a little last week, following the spurt in buying that came in the previous week when books were opened for the second quarter at $14, a reduction of $1. Second quarter requirements have been fairly well covered. The buying has been more general and in larger amounts than in the first quarter. A few of the small melters have covered, but the majority continue to pursue their usual hand-to-mouth buying policies.

Shipments this month have been averaging slightly under the February rate, but not enough under that they miss the production rate very far. The movement of iron to competitive territories is off a little as compared with February. The number of active furnaces has been at 17 for the past six weeks. Of this number, 10 are on foundry iron, six on basic and one recarburizing iron.

Prices per gross ton, f.o.b. Birmingham dist. furnaces:

No. 2 fdy., 1.75 to 2.25 sil.	$14.00
No. 1 fdy., 2.25 to 2.75 sil.	14.50
Basic	14.00

Finished Steel.—Both ingot and open-hearth production during the first quarter has exceeded that of the first quarter of last year. Also some lines of finished steel have been better. More sheets have been shipped this quarter than in any first quarter in years. The plate market continues better than last year, and structural shapes have done equally as well. Current production is at about the same level as in the past 30 days, and incoming business is sufficient to support present schedules. Export business has contributed important tonnages recently. There have been no changes in prices in several weeks.

Backlogs of structural steel fabricators have been further reduced, though at present they range from four to eight weeks at current production rates. Projects in the figuring stage are the lightest in some time. Reinforcing bar demand continues to improve, but it is not yet up to what is considered normal for this season. New orders of the Connors Steel Co. include 460 tons of the Alcee Fortier high school at New Orleans and 400

tons for the Robert E. Lee Hotel at Jackson, Miss.

Active open-hearths total 19, the same as last week.

Cast Iron Pipe.—The market for pressure pipe in the Southern territory is acquiring a better outlook with municipalities shaping their requirements and placing bond issues in the market. The outstanding project in this territory is 1000 tons of pipe for Shreveport, La., to be let March 27. Picayune, Miss., will take bids April 1 on a small project, and Greenville, S. C., will open bids March 31 on about 500 tons. Hattiesburg, Miss., intends to come into the market soon for a good tonnage.

Backlogs have been further increased in the last 10 days by bookings from the West and Middle West. District plants have been given orders totaling 15,000 tons for subsidiaries of the Commonwealth & Southern Corporation.

Plants generally are on a schedule of five days a week. The No. 1 foundry of the Central Foundry Co. was placed in operation last week after being closed down for about 60 days. March shipments have exceeded those of February by a good margin.

Prices are holding well at $37 to $38, base.

Coke.—The majority of the industrial coke consumers have contracted for their requirements for the second and third quarters. Active by-product ovens number 1201 of a total of 1390. Prices remain at $5 a net ton, Birmingham.

Old Material.—Dealers report a little better feeling in the market. There has been some inquiring for cast grades, but buying is still negligible. One of the larger steel mills continues to buy a part of its scrap direct. Trading is insufficient to furnish an accurate gage of prices.

Prices per gross ton, deliv'd Birmingham dist. consumers' yards:

Heavy melting steel	$13.00 to $13.50
Scrap steel rails	14.00
Short shoveling turnings	9.00
Cast iron borings	9.00
Stove plate	11.50 to 12.00
Steel axles	22.00
Iron axles	23.00
No. 1 railroad wrought	10.00 to 10.50
Rails for rolling	15.50
No. 1 cast	13.00
Tramcar wheels	12.50
Cast iron carwheels	13.00 to 13.50
Cast iron borings, chem.	13.50 to 14.00

Old Material.—Demand for old material is very quiet. Dealers say that mills are holding shipment on contracts to their actual needs. New business is almost negligible.

Although prices have not changed in two weeks, the weakness of demand, combined with the fairly good supply of scrap, causes an undertone of uncertainty. Dealers are not accumulating material, buying only enough to keep covered on commitments.

Dealers' buying prices per gross ton, f.o.b. cars, Cincinnati:

Heavy melting steel	$12.00 to $12.50
Scrap rails for melting	13.25 to 13.75
Loose sheet clippings	8.00 to 8.50
Bundled sheets	10.75 to 11.25
Cast iron borings	9.00 to 9.50
Machine shop turnings	8.25 to 8.75
No. 1 busheling	10.00 to 10.50
No. 2 busheling	6.50 to 7.00
Rails for rolling	13.50 to 14.00
No. 1 locomotive tires	14.25 to 14.75
No. 2 railroad wrought	12.25 to 12.75
Short rails	17.75 to 18.25
Cast iron carwheels	12.00 to 12.50
No. 1 machinery cast	18.50 to 19.00
No. 1 railroad cast	15.00 to 15.50
Burnt cast	10.00 to 10.50
Stove plate	10.00 to 10.50
Brake shoes	10.00 to 10.50
Agricultural malleable	14.00 to 14.50
Railroad malleable	15.00 to 15.50

Cincinnati

Pig Iron Sales Increase but Melters Are Buying Only for Nearby Needs—Sheet Orders Gain Slightly

CINCINNATI, March 25.—Although total sales of district furnace representatives increased to about 3560 tons last week, as compared with 1450 tons the week before, consumers are merely buying as needs arise, with no interest in covering for second quarter. There is only one inquiry for second quarter delivery before the trade. This is from a central Ohio buyer for 1000 tons of Northern foundry iron.

With virtually all the iron consuming industries in this district operating at well under capacity production, the first quarter is noticeably below the first quarter of 1929 in pig iron sales. February was the only month of this quarter that approached the normal demand, sales having averaged about 7000 tons a week during that month. The melt is still light.

Northern iron is still firm, with virtually no concessions, while Southern iron is now being sold openly at $13, base, Birmingham. But movement of Southern grades is still slow in this district. A central Indiana consumer bought 500 tons of Northern foundry iron, the remainder of the week's sales having been made up of small lots.

Prices per gross ton, deliv'd Cincinnati:

So. Ohio fdy., sil. 1.75 to 2.25	$19.89 to $20.39
Ala. fdy., sil. 1.75 to 2.25	16.69 to 17.69
Ala. fdy., sil. 2.25 to 2.75	17.19 to 18.19
Tenn. fdy., sil. 1.75 to 2.25	17.19 to 17.69
S'th'n Ohio silvery, 8 per cent	26.89

Freight rates, $1.89 from Ironton and Jackson, Ohio; $3.69 from Birmingham.

Coke.—With the melt still light, specifications for foundry grades of coke are slow. The total amount of coke moved on contract this month was much less than in February. Prices of by-product foundry coke continue at about $10.05, delivered in Cincinnati, for April. Reductions of 50c. and $1 on the various grades of domestic coke for April shipment bring these quotations to $5.50 for egg and furnace sizes and $5 for nut.

Finished Steel.—Demand for sheets last week continued at about 60 to 70 per cent of normal, with operations of district mills on a parity with new business. The requirements of manufacturers of automobiles, electric refrigerators and similar types of products are still about 60 per cent of normal demand, while the general sheet business is about 70 per cent. Consumers are not anticipating their needs, forcing district mills to rely on current business to sustain operations.

Warehouse Prices, f.o.b. Cincinnati

	Base per Lb.
Plates and struc. shapes	3.40c.
Bars, soft steel or iron	3.30c.
New billet reinforc. bars	3.15c.
Rail steel reinforc. bars	3.00c.
Hoops	4.05c.
Bands	3.50c.
Cold-fin. rounds and hex.	3.85c.
Squares	4.35c.
Black sheets (No. 24)	4.05c.
Galvanized sheets (No. 24)	4.90c.
Blue ann'l'd sheets (No. 10)	3.45c.
Structural rivets	4.20c.
Small rivets	60 per cent off list
No. 9 ann'l'd wire, per 100 lb.	$3.00
Com. wire nails, base per keg	2.85
Cement c't'd nails, base 100 lb. keg	2.85
Chain, per 100 lb.	10.25
	Net per 100 Ft.
Lap-welded steel boiler tubes, 2-in.	$16.50
4-in.	34.50
Seamless steel boiler tubes, 2-in.	17.50
4-in.	36.00

Canada

Pig Iron Buying Is More Promising

TORONTO, ONT., March 25.—While there is no apparent rush by pig iron melters to cover, many are coming into the market, and it now appears that second quarter business will exceed that of the first three months of the year. Some melters have stepped up their daily melt, while others have curtailed operations. It is estimated, however, that the melt ranges from 70 to 80 per cent. Canadian iron prices are unchanged.

Prices per gross ton:

Delivered Toronto	
No. 1 fdy., sil. 2.25 to 2.75	$22.60
No. 2 fdy., sil. 1.75 to 2.25	22.10
Malleable	22.60
Delivered Montreal	
No. 1 fdy., sil. 2.25 to 2.75	$24.00
No. 2 fdy., sil. 1.75 to 2.25	23.50
Malleable	24.00
Basic	22.50
Imported Iron, Montreal Warehouse	
Summerlee	$33.50
Carron	33.00

Structural Steel.—The opening of spring has so far failed to bring any great improvement in the demand for structural steel, but fabricators are of the opinion that buying on a more extensive scale will develop within the next two or three weeks. Several large contracts are pending for early closing, and in addition numerous orders involving up to 500 tons are in prospect. Sales for the week amounted to about 2000 tons, and

Warehouse Prices, f.o.b. St. Louis

	Base per Lb.
Plates and struc. shapes	3.25c.
Bars, soft steel or iron	3.15c.
Cold-fin. rounds, shafting, screw stock	3.75c.
Black sheets (No. 24)	4.25c.
Galv. sheets (No. 24)	4.85c.
Blue ann'l'd sheets (No. 10)	3.45c.
Black corrug. sheets (No. 24)	4.30c.
Galv. corrug. sheets	4.90c.
Structural rivets	4.15c.
Boiler rivets	4.15c.
	Per Cent Off List
Tank rivets, ⅞-in. and smaller, 100 lb. or more	65
Less than 100 lb	60
Machine bolts	60
Carriage bolts	60
Lag screws	60
Hot-pressed nuts, sq., blank or tapped, 200 lb. or more	60
Less than 200 lb	50
Hot-pressed nuts, hex., blank or tapped, 200 lb. or more	60
Less than 200 lb	50

prospective business in Eastern Canada is about 40,000 tons.

Old Material.—The demand for steel scrap is sluggish both in the Toronto and Montreal districts, while iron grades have had a fairly steady call. Dealers are accumulating larger tonnages, with better offerings coming from the rural districts. Prices are unchanged.

Dealers' buying prices:

Per Gross Ton	Toronto	Montreal
Heavy melting steel	$9.00	$8.00
Rails, scrap	11.00	9.00
No. 1 wrought	9.00	11.00
Machine shop turnings	7.00	6.00
Boiler plate	7.00	6.50
Heavy axle turnings	7.50	6.50
Cast borings	6.50	5.00
Steel borings	6.50	6.00
Wrought pipe	6.00	6.00
Steel axles	14.00	17.00
Axles, wrought iron	16.00	19.00
No. 1 machinery cast	....	16.00
Stove plate	....	12.00
Standard carwheels	....	14.50
Malleable	....	13.00
Per Net Ton		
No. 1 mach'ry cast	$15.00	....
Stove plate	11.00	....
Standard carwheels	14.00	....
Malleable scrap	11.00	....

Warehouse Prices, f.o.b. Boston

	Base per Lb.
Plates	3.365c.
Structural shapes—	
Angles and beams	3.365c.
Tees	3.365c.
Zees	3.465c.
Soft steel bars, small shapes	3.265c.
Flats, hot-rolled	4.15c.
Reinforcing bars	3.265c. to 3.54c.
Iron bars—	
Refined	3.265c.
Best refined	4.60c.
Norway rounds	6.60c.
Norway squares and flats	7.10c.
Spring Steel—	
Open-hearth	5.00c. to 10.00c.
Crucible	12.00c.
Tie steel	4.50c. to 4.75c.
Bands	4.015c. to 5.00c.
Hoop steel	5.50c. to 6.00c.
Cold-rolled steel—	
Rounds and hex	*3.55c. to 5.55c.
Squares and flats	*4.05c. to 7.05c.
Toe calk steel	6.00c.
Rivets, structural or boiler	4.50c.
	Per Cent Off List
Machine bolts	50 and 5
Carriage bolts	50 and 5
Lag screws	50 and 5
Hot-pressed nuts	50 and 5
Cold-punched nuts	50 and 5
Stove bolts	70 and 10

*Including quantity differentials.

St. Louis

Pig Iron Melt Gaining—Railroads Inquire for Second Quarter Steel Requirements—Scrap Market Weak

ST. LOUIS, March 25.—Melt of pig iron in the St. Louis industrial district continues heavy. Steel plants are taking their full schedules of basic iron, the malleable plants are operating at increased capacity, and there is an improvement in the consumption of foundry iron, especially among the foundries catering to the implement and stove trade, while the automotive trade is picking up.

Shipments of pig iron continue heavy, the March movement from the furnaces of the St. Louis Gas & Coke Corporation promising to exceed the total for last March. However, buying continues light. The local maker sold approximately 3000 tons, all foundry iron, the largest order being for 1000 tons. A leading Southern independent sold 700 tons.

The reduction of $1 a ton in the base price at Birmingham has not affected the price for delivery to this territory.

Prices per gross ton at St. Louis:

No. 2 fdy., sil. 1.75 to 2.25, f.o.b. Granite City, Ill.	$19.50
Malleable, f.o.b. Granite City	20.00
N'th'n No. 2 fdy., deliv'd St. Louis	22.16
Southern No. 2 fdy., deliv'd	17.42 to 18.42
Northern malleable, deliv'd	22.16
Northern basic, deliv'd	22.16

Freight rates: 75c. (average) Granite City to St. Louis; $2.16 from Chicago; $4.42 from Birmingham.

Finished Steel.—The Missouri Pacific, Missouri-Kansas-Texas and Wabash railroads have issued inquiries for prices on second quarter requirements of plates, shapes, bars and sheets, and the St. Louis Southwestern Railway has also asked for prices for the same period on track spikes and bolts. No quantities are specified. An improvement is reported in the demand for plates, shapes and bars from other sources.

The Missouri Rolling Mills Corporation got an order for 1500 tons of reinforcing bars for the International Shoe Co.'s warehouse. Demand for structural steel is light.

Old Material.—The scrap market is weaker, and some items are from 25c. to 50c. lower, this being due to a freer movement of scrap to this center by railroads and dealers and a light demand from consumers in the district. Railroad lists: Terminal Railway Association of St. Louis, 3500 tons; Missouri-Kansas-Texas, 300 tons cast wheels; New York, Chicago & St. Louis, 25 carloads; Chicago & Eastern Illinois, 11 carloads; Chicago, Great Western, 10 carloads.

Dealers' buying prices per gross ton f.o.b. St. Louis district:

Selected heavy melting steel	$13.25 to $13.75
No. 1 heavy melting or shoveling steel	12.25 to 12.75
No. 2 heavy melting or shoveling steel	11.50 to 12.00
No. 1 locomotive tires	14.50 to 15.00
Misc. stand.-sec. rails including frogs, switches and guards, cut apart	13.00 to 13.50
Railroad springs	16.00 to 16.50
Bundled sheets	9.50 to 10.00
No. 2 railroad wrought	12.50 to 13.00
No. 1 busheling	9.75 to 10.25
Cast iron borings and shoveling turnings	9.25 to 9.75
Iron rails	13.00 to 13.50
Rails for rolling	14.00 to 14.50
Machine shop turnings	6.75 to 7.25
Heavy turnings	9.00 to 9.50
Steel car axles	19.00 to 19.50
Iron car axles	26.00 to 26.50
Wrot. iron bars and trans.	20.00 to 20.50
No. 1 railroad wrought	12.00 to 12.50
Steel rails, less than 3 ft.	16.50 to 17.00
Steel angle bars	13.50 to 14.00
Cast iron carwheels	14.00 to 14.50
No. 1 machinery cast	15.25 to 15.75
Railroad malleable	14.75 to 15.25
No. 1 railroad cast	14.00 to 14.50
Stove plate	11.50 to 12.00
Relay. rails, 60 lb. and under	20.50 to 23.50
Relay. rails 70 lb. and over	26.50 to 29.00
Agricult. malleable	13.00 to 13.50

Boston

Buffalo Furnaces Asking Higher Prices for Pig Iron—Scrap Trade Shows No Improvement

BOSTON, March 25.—Buffalo district furnaces have announced higher prices on pig iron. One furnace is asking $17, base, for New England shipment, while others quote a minimum of $16.50. A few small sales are said to have been made at the new prices, but there has been no real test on large tonnage.

The H. B. Smith Co., Westfield, Mass., has intimated that it will soon purchase 5000 tons or more for which it has recently been inquiring. There are no other important open inquiries in the market. The New England foundry melt is increasing very slowly, having gained less than 10 per cent since Jan. 1.

Foundry iron prices per gross ton deliv'd to most New England points:

†Buffalo, sil. 1.75 to 2.25	$20.28 to	$21.28
†Buffalo, sil. 2.25 to 2.75	20.78 to	21.78
*Buffalo, sil. 1.75 to 2.25	20.91 to	21.91
*Buffalo, sil. 2.25 to 2.75	21.41 to	22.41
Va., sil. 1.75 to 2.25		25.21
Va., sil. 2.25 to 2.75		25.71
*Ala., sil. 1.75 to 2.25		22.61
*Ala., sil. 2.25 to 2.75		23.11
†Ala., sil. 1.75 to 2.25		18.75
†Ala., sil. 2.25 to 2.75		19.25

Freight rates: $4.91 all rail and $4.28 rail and water from Buffalo; $5.21 all rail from Virginia; $9.61 all rail from Alabama and $5.75 rail and water from Alabama to New England seaboard.
*All rail rate.
†Rail and water rate.

Cast Iron Pipe.—Quincy, Mass., has bought 1000 tons of pipe and Framingham, Mass., 500 tons from the Warren Foundry & Pipe Co. Other municipal lettings were private and totaled about 2000 tons. Pending projects follow: Holyoke, Mass., 1500 tons of 6 to 24-in. pipe, bids March 28; Brockton, Mass., 150 tons of 6 to 12-in., bids April 5; Athol, Mass., 150 tons of 6 to 12-in., bids April 5; North Andover, Mass., 100 tons, bids March 27.

Pipe prices are reported as firm at $37 a ton, Birmingham, for 6-in. and larger sizes. A $4 differential is asked on Class A and gas pipe.

Reinforcing Steel.—Upward of 250 tons of billet steel reinforcing bars was sold the past week through local houses. Vermont is to start work at once on two roads that will require 1200 tons of bars. Prices are: 1 to 5-ton lots, 3.06½c. a lb., base, from stock; 5 to 99 tons, 2.66½c.; 100-ton and larger lots, 2.56½c.

Old Material.—No improvement in business is noted, and mills do not indicate when they will buy freely again. With the lull has come easier prices for No. 1 heavy melting steel, steel turnings, steel mill borings, forge flashings, mixed borings and turnings, pipe, and rails for rerolling. Textile machinery cast is now generally $13 to $13.50 a ton, delivered, contrasted with $13.50 to $14 a week ago. The top price on heavy melting steel today is $10.25 a ton, on cars shipping point, off 25c. The spread in prices for that material, as well as for steel turnings, mixed borings and turnings and pipe, is unusually narrow. Two local dealers this week will export 2000 tons of scrap to Japan. It is expected a boat will load scrap here early next month for Danzig.

Buying prices per gross ton, f.o.b. Boston rate shipping points:

No. 1 heavy melting steel	$10.00 to $10.25
Scrap T rails	10.00 to 10.30
Scrap girder rails	9.00 to 9.50
No. 1 railroad wrought	10.00 to 11.00
Machine shop turnings	6.00 to 6.25
Cast iron borings (steel works and rolling mill)	6.00 to 6.60
Bundled skeleton, long	8.75 to 9.30
Forge flashings	8.50 to 9.00
Blast furnace borings and turnings	5.50 to 5.60
Forge scrap	8.50 to 9.00
Shafting	14.00 to 15.00
Steel car axles	16.00 to 16.50
Wrought pipe, 1 in. in diameter (over 2 ft. long)	8.85 to 9.00
Rails for rolling	10.75 to 11.00
Cast iron borings, chemical	9.00 to 9.25
Prices per gross ton deliv'd consumers' yards:	
Textile cast	$13.00 to $13.50
No. 1 machinery cast	14.50 to 15.25
No. 2 machinery cast	14.00 to 14.50
Stove plate	11.00 to 11.50
Railroad malleable	16.50 to 17.00

Youngstown

Outlook Improving for Tubular Goods but Other Products Show No Definite Trend—Prices No Stronger

YOUNGSTOWN, March 24.—The first quarter is coming to a close with no definite trend in sight. Buying of steel products made by Valley mills has shown little improvement, but the decline in specifications which was first felt about a month ago has apparently been checked. Mills are receiving a fair tonnage in small orders for immediate shipment, these being just sufficient to maintain an aggregate finishing operation of 60 to 65 per cent. Open-hearth production last week was not above 50 per cent, but increases are planned by some companies.

Among the specific products the outlook for pipe seems best at this time. Although little activity in oil well casing is expected for the year as a whole, the growing interest of the oil and public utility companies in gasoline and gas-carrying lines has led to a feeling of optimism among makers of tubing, particularly in the smaller sizes. Considerable inquiry is already outstanding, and, if only half of the projects under consideration materialize, the small-pipe capacity of Valley mills might well be occupied for the rest of the year. The Republic Iron & Steel Co. is rushing the second unit of its electrically-welded pipe mill to completion, and will then be able to furnish material up to 18 in. in diameter.

With only two makers of automobiles specifying steel in anything approaching normal volume, the sheet and strip business is depressed. This is particularly true in the case of hot and cold-rolled strip, as sheet tonnage is somewhat more diversified. Local makers of building materials are improving their operations as the warmer weather approaches, and this outlet is partially making up for the decline in automobile tonnage. Full finishing mills, which were able to maintain a fairly good operation this month because of the impetus of February business, face the necessity of more limited production in April.

Sheet prices lack strength, and quotations for the second quarter are not clearly defined. Business in black and galvanized material has been taken for at least a good part of the second quarter at 2.65c. and 3.30c., Pittsburgh, respectively, although some mills have not ceased quoting prices $2 higher to their smaller customers. A policy of granting automobile manufacturers a regular concession from prices paid by the remainder of the trade is being considered, but is regarded with disfavor by some producers. Particular weakness exists in automobile body sheets, with a 3.80c., Pittsburgh, price growing more common in the Detroit territory. The new producer at Monroe, Mich., is adhering to a Pittsburgh base, but the starting of a new mill at that point has given consumers in the Detroit district added incentive to hammer down prices. Metal furniture sheets are fairly well established at 3.90c., Pittsburgh, with some producers trying to get 4c. Demand is steady, but not in large volume.

Prices on blue annealed sheets and light plates are muddled on account of the competition of continuous mills, as jobbing mills have sought to meet the quotations of the continuous producers on rather small tonnages on one or two occasions. However, leading operators of jobbing mills are making strenuous efforts to hold prices at 2.10c., Pittsburgh, on light plates, and 2.25c. on blue annealed sheets. Continuous mill quotations are $2 to $4 a ton under these figures.

Demand for bars is very sluggish, and concessions from the 1.85c., Pittsburgh or Cleveland quotation, are reported from Detroit. Bar mills are not averaging above 60 per cent of capacity, and consumers are not anxious to renew second quarter contracts. Tin mill operations are at practical capacity in the local mill, and production of nails and wire has picked up slightly in the last few weeks to meet spring demand. Here again price weakness is deterring second quarter contracting.

Sales of pig iron by local furnaces are in small volume, and light operations of small steel companies have adversely influenced shipments of some furnaces. This is allowing stocks of iron to increase for the first time in many months with some producers. There has been no change in prices, and small spot sales are still being made at $18.50 for foundry and basic iron and $19 for malleable and Bessemer.

The scrap market is quiet, with restricted consumption at the principal consuming points. Heavy melting steel is quotable at about $16, and hydraulic compressed sheets at slightly less.

Declines in Some Grades of Scrap at Detroit

DETROIT, March 25.—Due to holdups from several mills, borings and short turnings declined 25c. a ton during the past week. New No. 1 busheling and flashings declined the same amount. Automotive production promises to increase slightly during April.

Dealers' buying prices per gross ton, f.o.b. cars, Detroit:

Hvy. melting and shov. steel	$11.75 to $12.25
Borings and short turnings	8.00 to 8.50
Long turnings	7.25 to 7.75
No. 1 machinery cast	11.50 to 12.00
Automotive cast	13.00 to 13.50
Hydraul. comp. sheets	11.25 to 11.75
Stove plate	9.00 to 9.50
New No. 1 busheling	10.75 to 11.25
Old No. 1 busheling	8.75 to 9.25
Sheet clippings	8.50 to 9.00
Flashings	10.50 to 11.00

Buffalo

Pig Iron Sales Close to 25,000 Tons—Higher Prices Now Quoted for Eastern Shipment

BUFFALO, March 25.—Considerably increased interest in pig iron resulted in sales of between 20,000 to 25,000 tons during the past week. Several important Eastern buyers have covered for part or all of their second quarter needs. Higher prices for Eastern shipment are now being quoted.

Sales included several lots of foundry and malleable iron of about 1000 tons each and one lot of 3000 tons of low silicon foundry to a central New York melter. Aggregate inquiries still pending amount to about 8000 tons, including one from the General Electric Co. of 2500 tons of foundry iron, mostly high silicon. This tonnage may be increased. District consumption has been good. District sales were mostly at $18.50, base.

Prices per gross ton, f.o.b. furnace:

No. 2 fdy., sil. 1.75 to 2.25	$18.50
No. 2X fdy., sil. 2.25 to 2.75	19.00
No. 1 fdy., sil. 2.75 to 3.25	20.00
Malleable, sil. up to 2.25	19.00
Basic	17.00
Lake Superior charcoal	27.28

Finished Steel.—There has been a slight increase in Buffalo mill operations in the past week. The Lackawanna plant of the Bethlehem Steel Co. is operating 21 of its 24 open-hearths, the highest point reached in some time. The other plants remain at about the same level as last week.

Automobile sheet buying in this district is more encouraging. Reinforcing bar market is active, with a volume of small lots. Bids on several Erie County highway bridges will come up March 25 and April 1. These contracts involve several hundred tons of bars. Structural steel business is very quiet.

Old Material.—The feature of the week's market was the purchase of No. 1 heavy melting steel by two of the principal consumers in the district. One interest paid $15.25 for strictly No. 1 steel and bought 4000 tons. The other mill paid $14 for No. 1 and $12.50 for No. 2. The market is sentimentally softer.

Some small sales of stove plate at $12.25 and No. 1 machinery cast at $13 are reported. An offer of $11 has been made for blast furnace scrap by a consumer. Shoveling turnings have been sold at $12.25 to $12.50, and machine shop turnings at a frontier point at $10.75 to $11.

Prices per gross ton f.o.b. Buffalo consumers' plants:

Basic Open-Hearth Grades:	
No. 1 heavy melting steel	$14.00 to $15.00
No. 2 heavy melting scrap	12.50
Scrap rails	14.75 to 15.25
Hydraul. comp. sheets	12.50
Hand bundled sheets	10.50 to 11.00
Drop forge flashings	12.50
No. 1 busheling	13.00 to 13.75
Hvy. steel axle turnings	13.50 to 14.00
Machine shop turnings	9.00 to 9.50
No. 1 railroad wrought	11.00 to 11.50
Acid Open-Hearth Grades:	
Knuckles and couplers	18.00 to 18.50
Coil and leaf springs	18.00 to 18.50
Rolled steel wheels	18.00 to 18.50
Low phos. billet and bloom ends	18.00 to 18.50
Electric Furnace Grades:	
Short shov. steel turnings	12.00 to 12.50
Blast Furnace Grades:	
Short mixed borings and turnings	11.00 to 11.50
Cast iron borings	11.00 to 11.50
No. 2 busheling	8.00
Rolling Mill Grades:	
Steel car axles	17.00 to 17.50
Iron axles	20.00 to 21.00
Cupola Grades:	
No. 1 machinery cast	13.00 to 13.50
Stove plate	12.00 to 12.50
Locomotive grate bars	10.50 to 11.00
Steel rails, 3 ft. and under	17.50 to 18.00
Cast iron carwheels	12.00 to 12.50
Malleable Grades:	
Industrial	16.50 to 17.00
Railroad	16.50 to 17.00
Agricultural	16.50 to 17.00
Special Grades:	
Chemical borings	12.00 to 12.50

Warehouse Prices, f.o.b. Buffalo

	Base per Lb.
Plates and struc. shapes	3.40c.
Soft steel bars	3.30c.
Reinforcing bars	2.95c.
Cold-fin. flats and sq.	3.65c.
Rounds and hex.	3.15c.
Cold-rolled strip steel	5.85c.
Black sheets (No. 24)	4.20c.
Galv. sheets (No. 24)	4.85c.
Blue ann'l'd sheets (No. 10)	3.50c.
Com. wire nails, base per keg	$3.20
Black wire, base per 100 lb.	3.50

Reinforcing Steel

Awards 9000 Tons — New Inquiries More Than 6700 Tons

REINFORCING steel awards the past week totaled about 9000 tons. The largest letting, 3000 tons, was for plant buildings for the American Can Co. at Chicago. New jobs up for bids amount to more than 6700 tons and include 3000 tons for State road work at Springfield, Ill. Several projects are pending on which the tonnage is still being estimated. Awards follow:

BRENTWOOD, N. Y., 800 tons, State hospital, to E. T. Edwards.

NEW YORK, 800 tons of mesh, Empire State Building, to Concrete Steel Co.

BROOKLYN, 360 tons, subway section 7, route 108, to Igoe Brothers.

ORANGEBURG, N. Y., 700 tons, State hospital, to E. T. Edwards.

PASSAIC, N. J., 100 tons, United States Rubber Co. plant, to Truscon Steel Co.

NEW ORLEANS, 460 tons, Alcee Fortier High School, to Connors Steel Co.

JACKSON, MISS., 400 tons, Robert E. Lee Hotel, to Connors Steel Co.

CHICAGO, 450 tons, Continental Can Co., to Jones & Laughlin Steel Corporation.

CHICAGO, 3000 tons, buildings for American Can Co., to unnamed fabricator.

ST. LOUIS, 1500 tons, warehouse for International Shoe Co., to Missouri Rolling Mill Corporation.

SEATTLE, 350 tons, immigrant station, to Pacific Coast Steel Corporation.

SACRAMENTO, 120 tons, four bridges in San Joaquin County, to an unnamed bidder.

SACRAMENTO, 192 tons, highway work in San Joaquin County, to an unnamed bidder.

Reinforcing Bars Pending

Inquiries for reinforcing steel bars include the following:

STATE OF VERMONT, 1200 tons, road work.

BRENTWOOD, N. Y., 2000 tons, Pilgrim State Hospital; reported last week as 1000 tons; general contract awarded to Turner Construction Co., steel not yet awarded.

OZONE PARK, N. Y., 500 tons, grade separation work on Long Island Railroad; P. T. Cox Contracting Co., New York, general contractor.

CAMDEN, N. J., 100 tons, club house for Loyal Order of Moose; J. M. Yardley, Philadelphia, general contractor.

WHITE SULPHUR SPRINGS, W. VA., 500 tons, Green Brier Hotel.

MORGAN PARK, ILL., tonnage being estimated, school.

CHICAGO, tonnage being estimated, Gore Printing Co. plant addition; Kenneth White, architect.

CHICAGO, tonnage being estimated, Paramount Film Exchange at 13 South Michigan Avenue.

CHICAGO, 112 tons, Whittier School.

SPRINGFIELD, ILL., tonnage not stated, 10-story office building for Central Illinois Public Service Co.

SPRINGFIELD, ILL., 3000 tons, 300 miles of State road work.

MILWAUKEE, 400 tons, Post Office.

Railroad Equipment

Freight Car Inquiry at a Low Point

PENDING inquiries for freight cars are the smallest in at least a year, according to car builders. The total number on which bids have gone in is about 750. No further inquiry is definitely in sight, though it is expected that a number of roads, including the New York Central and Pennsylvania, may inquire within a month or two. The week's business was as follows:

Pacific Fruit Express has ordered 500 refrigerator cars from its own shops.

Chicago, Milwaukee, St. Paul & Pacific has bought two air dump cars from Western Wheeled Scraper Co.

Chicago, St. Paul, Minneapolis & Omaha will buy three 4-6-2 type passenger locomotives.

February Non-Ferrous Ingot Deliveries

The combined deliveries of brass and bronze ingots and billets by the members of the Non-Ferrous Ingot Metal Institute for the month of February amounted to a total of 6898 tons. In January they were 6154 tons, and in December, 5167 tons.

Steel Founders Meet in June

The Steel Founders' Society of America will hold its semi-annual convention on June 26, 27 and 28 at the Greenbrier Hotel, White Sulphur Springs, W. Va. Granville P. Rogers, 932 Graybar Building, New York, is managing director of the society.

Non-Ferrous Metal Markets

Copper More Active—Tin Higher—Lead Advanced—Zinc Lowest in Eight Years

NEW YORK, March 25.

Copper.—Conditions have improved, particularly in foreign sales. Since Thursday, inclusive, 9000 gross tons was sold for export, distributed about as follows: 2000 tons this morning, 1700 tons yesterday, 800 tons Saturday, 2500 tons Friday and 2000 tons Thursday. These sales make the total for the month to March 25 inclusive about 27,000 tons, which is fully equal to the sales in the corresponding period last month. If this rate is approximated for the rest of the month, the total will be the largest foreign sales for any month in the last five.

The domestic situation is not satisfactory to producers. Sales are made every day, always for immediate shipment. The total volume, however, is not large, but is said to be slowly increasing. One producer states that total domestic sales at present are about 70 per cent of what they were a year ago.

The price situation is unchanged and still firm. Electrolytic copper is quoted at 18c., delivered in the Connecticut Valley, and the price for export is 18.30c., c.i.f. usual European ports. Lake copper is moderately active at 18c. to 18.12½c., delivered.

Tin.—The past week has been one of the dullest in a long time, due largely to a marked advance in prices here and in London. Because of this, consumers have not been following the market and sales have been very light. Only about 150 tons was sold for the week ended today, those sales having been made mostly on Saturday, March 22, calling for spot, March and April delivery.

Due to speculative buying, London prices today were about £8 per ton higher than a week ago, with spot standard quoted at £170, future standards at £171 15s., and spot Straits at £172 5s. The Singapore price today was £173 10s. In a very dull market today, spot Straits tin was quoted here at 37.87½c., New York. Stocks in London warehouses during the week ended March 22 increased 290 tons and now stand at 15,684 tons.

Lead.—Following another week of heavy buying the American Smelting & Refining Co. today advanced its New York contract price from 5.50c. to 5.65c., New York. At 5.50c. the market had stood for several days at the lowest price in nearly eight years, or since May 16, 1922, when 5.40c.

THE WEEK'S PRICES. CENTS PER POUND FOR EARLY DELIVERY

	Mar. 25	Mar. 24	Mar. 22	Mar. 21	Mar. 20	Mar. 19
Lake copper, New York	18.12½	18.12½	18.12½	18.12½	18.12½	18.12½
Electrolytic copper, N. Y.*	17.75	17.75	17.75	17.75	17.75	17.75
Straits tin, spot, N. Y.	37.87½	37.87½	37.12½	36.87½	36.75	36.00
Zinc, East St. Louis	4.85	4.85	4.87½	4.87½	4.87½	4.90
Zinc, New York	5.20	5.20	5.22½	5.22½	5.22½	5.25
Lead, St. Louis	5.55	5.40	5.40	5.40	5.40	5.40
Lead, New York	5.65	5.50	5.50	5.50	5.50	5.50

*Refinery quotation; price ¼c. higher delivered in the Connecticut Valley.

Rolled Products

List Prices, Per Lb., f.o.b. Mill

On Copper and Brass Products, Freight up to 75c. per 100 Lb. Allowed on Shipments of 500 Lb. or Over

Sheets—
- High brass ..... 23.25c.
- Copper, hot rolled ..... 26.75c.
- Zinc ..... 10.00c.
- Lead (full sheets) ..... 9.50c.

Seamless Tubes—
- High brass ..... 28.25c.
- Copper ..... 29.25c.

Rods—
- High brass ..... 21.25c.
- Naval brass ..... 24.00c.

Wire—
- Copper ..... 19.87½c.
- High brass ..... 23.75c.

Copper in Rolls ..... 26.75c.

Brazed Brass Tubing ..... 30.87½c.

Aluminum Products in Ton Lots

The carload freight rate is allowed to destinations east of Mississippi River and also to St. Louis on shipments to points west of that river.

- Sheets, 0 to 10 gage, 3 to 30 in. wide ..... 31.30c.
- Tubes, base ..... 42.00c.
- Rolled rods in coils ..... 31.00c.

Chicago Warehouse

(Prices Cover Trucking to Customers' Doors in City Limits)

Sheets—	Base per Lb.
High brass	23.25c.
Copper, hot rolled	27.75c.
Copper, cold rolled, 14 oz. and heavier	30.00c.
Zinc	10.75c.
Lead, wide	10.05c.
Seamless Tubes—	
Brass	28.25c.
Copper	29.25c.
Brass Rods	21.25c.
Brazed Brass Tubes	31.00c.

New York or Cleveland Warehouse

Delivered Prices, Base per Lb.

High brass	21.12½c.	to 22.12½c.
Copper, hot rolled, base sizes	27.75c.	to 28.75c.
Copper, cold rolled, 14 oz. and heavier, base sizes	30.00c.	to 31.00c.
Seamless Tubes—		
Brass	26.00c.	to 27.00c.
Copper	29.12½c.	to 30.12½c.
Brass Rods	18.87½c.	to 19.87½c.
Brazed Brass Tubes	29.12½c.	to 30.12½c.

New York Warehouse

Delivered Prices, Base per Lb.

- *Zinc sheets (No. 9), casks* ..... 10.25c. to 11.00c.
- *Zinc sheets, open* ..... 11.25c. to 11.75c.

Metals from New York Warehouse

Delivered Prices, Per Lb.

Tin, Straits pig	39.50c. to 40.50c.
Tin, bar	41.50c. to 42.50c.
Copper, Lake	19.50c.
Copper, electrolytic	19.25c.
Copper, casting	19.00c.
Zinc, slab	6.50c. to 7.50c.
Lead, American pig	6.50c. to 7.00c.
Lead, bar	8.50c. to 9.00c.
Antimony, Asiatic	10.50c. to 11.00c.
Aluminum No. 1 ingots for remelting (guaranteed over 99% pure)	25.00c. to 26.00c.
Alum. ingots, No. 12 alloy	24.00c. to 25.00c.
Babbitt metal, commercial grade	25.00c. to 35.00c.
Solder, ½ and ½	26.00c. to 27.00c.

Metals from Cleveland Warehouse

Delivered Prices, Per Lb.

Tin, Straits pig	42.00c.
Tin, bar	44.00c.
Copper, Lake	19.50c.
Copper, electrolytic	19.25c.
Copper, casting	18.75c.
Zinc, slab	7.50c. to 7.75c.
Lead, American pig	6.50c. to 6.75c.
Lead, bar	8.75c.
Antimony, Asiatic	16.00c.
Babbitt metal, medium grade	17.50c.
Babbitt metal, high grade	45.00c.
Solder, ½ and ½	27.50c.

Old Metals, Per Lb., New York

Buying prices represent what large dealers are paying for miscellaneous lots from smaller accumulators and selling prices are those charged consumers after the metal has been properly prepared for their uses.

	Dealers' Buying Prices	Dealers' Selling Prices
Copper, hvy. crucible	15.00c.	16.50c.
Copper, hvy. and wire	14.50c.	16.25c.
Copper, light and bottoms	12.50c.	14.00c.
Brass, heavy	8.00c.	9.25c.
Brass, light	6.75c.	7.75c.
Hvy. machine composition	11.25c.	12.25c.
No. 1 yel. brass turnings	9.00c.	9.50c.
No. 1 red brass or compos. turnings	10.50c.	11.75c.
Lead, heavy	4.25c.	4.625c.
Lead, tea	3.00c.	3.50c.
Zinc	2.75c.	3.25c.
Sheet aluminum	10.00c.	12.00c.
Cast aluminum	9.50c.	11.50c.

was the New York quotation. The price at St. Louis was also advanced today and stands at 5.55c. One producer in that district is almost sold out. The London market also advanced early today.

Zinc.—Further weakness has developed in prime Western zinc which is now quoted at 4.85c., East St. Louis, or 5.20c., New York. This is the lowest price in almost eight years, or since April 6, 1922, when the New York quotation was 5.17½c. Demand from consumers or dealers is very light but some sales are made each day. It is believed by some that the bottom of the market has been reached.

The ore price is still unchanged at $37, Joplin. Production was about 9800 tons last week, practically unchanged from the week before, with sales at 6470 tons, also about equal to the previous week. Shipments fell off to a little over 8800 tons as a result of smaller purchases. The surplus is estimated at a little over 10,800 tons, which is still regarded as a tight position.

Antimony.—Demand is light and quotations are a little lower for Chinese metal at 7.87½c. for both spot and futures.

Nickel.—Ingot nickel in wholesale lots is quoted at 35c. a lb. with shot nickel at 36c. and electrolytic nickel in cathodes at 35c.

Aluminum.—Virgin metal, 98 to 99 per cent pure, according to published quotations, is unchanged at 23.90c. a lb., delivered.

Non-Ferrous Metals at Chicago

CHICAGO, March 25.—The local market for tin and lead is firm and active. Orders for copper are in fair volume. The old metal market is quiet.

Prices per lb., in carload lots: Lake copper, 18.50c.; tin, 38.60c.; lead, 5.60c.; zinc, 5c.; in less-than-carload lots, antimony, 9c. On old metals we quote copper wire, crucible shapes and copper clips, 14c.; copper bottoms, 11.50c.; red brass, 11.50c.; yellow brass, 8c.; lead pipe, 4c.; zinc, 3c.; pewter, No. 1, 18c.; tin-foil, 20c. block tin, 25c.; aluminum, 12.87½c.; all being dealers' prices for less-than-carload lots.

Fabricated Structural Steel

Awards Total 20,000 Tons—Inquiries of 16,000 Tons Include 7500 Tons for New York Office Building

AWARDS of structural steel in the past week totaled about 20,000 tons, the smallest week's business since the end of February. The larger contracts were 3000 tons for a penstock for the Pacific Gas & Electric Co. in San Francisco, 2800 tons for a building in Hopewell, Va., for the Atmospheric Nitrogen Corporation, and 1700 tons for a bridge in Baltimore. New projects totaling more than 16,000 tons included 7500 tons for an office building in New York and 2000 tons for 11 hospital buildings at Central Islip, N. Y.

JEWETT CITY, CONN., 125 tons, bridge, to Boston Bridge Works, Inc.

NEW YORK, 800 tons, building for Mount Sinai Hospital, to Hay Foundry & Iron Works.

NEW YORK, 250 tons, Bronx Home News building on East 148th Street, to George A. Just Co.

PASSAIC, N. J., 500 tons, building for United States Rubber Co., to Belmont Iron Works.

WILMINGTON, DEL., 1440 tons, office building for E. I. du Pont de Nemours & Co., to Bethlehem Steel Co.

BALTIMORE, 1700 tons, bridge at Pennington Avenue, to American Bridge Co.

PHOENIXVILLE, PA., 505 tons, high school, to Phoenix Bridge Co.

READING RAILROAD, 210 tons, bridge at Meadowbrook, Pa., to Phoenix Bridge Co.

PENNSYLVANIA RAILROAD, 419 tons, bridges at Sunbury and Harrisburg, to Phoenix Bridge Co.

PHILADELPHIA, 250 tons, junior high school, to McClintic-Marshall Co.

PHILADELPHIA, 340 tons, general hospital building, to American Bridge Co.

READING, PA., 325 tons, Medical Arts Building, to Bauman Iron Works.

PITTSBURGH, 100 tons, gates for Lock No. 8 for United States Engineer, to Independent Bridge Co.

TURTLE CREEK, PA., 1200 tons, Moss Side Boulevard, bridge No. 4, to Independent Bridge Co.

HOPEWELL, VA., 2800 tons, building for Atmospheric Nitrogen Corporation, to Virginia Bridge & Structural Co.

CHICAGO, 450 tons, warehouse for Commonwealth Edison Co., to McClintic-Marshall Co.

CHICAGO, 105 tons, building for the Sanitary District trustees, to Duffin Iron Co.

MANTENO, ILL., 650 tons, power house for a State institution, to Duffin Iron Co.

MILWAUKEE ROAD, 300 tons, bridge at River Grove, to American Bridge Co.

MARATHON, WIS., 380 tons, bridge, to Wausau Iron Works.

MILWAUKEE, 350 tons, 105th Cavalry Armory, to Worden-Allen Co.

UNION PACIFIC RAILROAD, 175 tons, extension of subway at Omaha, Neb., to Omaha Structural Steel Co.

KANSAS CITY, MO., 400 tons, viaduct, to Worden-Allen Co.

KANSAS CITY, MO., 150 tons, garage for National Garages, Inc., to McClintic-Marshall Co.

SEATTLE, 250 tons, plates, two 20,000-bbl. tanks for Sunset Pacific Oil Co., to Steel Tank & Pipe Co.

HOQUIAM, WASH., 100 tons, Little Hoquiam River bridge, to Pacific Car & Foundry Co.

PASADENA, CAL., 125 tons, service station, Union and Delacey Streets, to McClintic-Marshall Co.

HOLLYWOOD, CAL., 550 tons, toll building for Southern California Telephone Co., to Consolidated Steel Corporation.

SAN FRANCISCO, 230 tons, two wing additions to State Building, to Dyer Bros.

SAN FRANCISCO, 3000 tons, plates, penstock for Pacific Gas & Electric Co. at Tiger Creek, to Western Pipe & Steel Co.

SAN FRANCISCO, 1000 tons, plates, two siphons for Pacific Gas & Electric Co. at Tiger Creek, to M. W. Kellogg & Co.

SAN FRANCISCO, 640 tons, abrasive plates for Southern Pacific Co., to unnamed Eastern mill.

Structural Projects Pending

Inquiries for fabricated steel work include the following:

WATERBURY, CONN., 200 tons, Southern New England Telephone Co. building.

NEW YORK, 7500 tons, Bartholomew Building, Lexington Avenue and Fifty-first Street.

NEW YORK, 900 tons, school No. 144 in Queens.

NEW YORK, 200 tons, child educational building on East Eighty-fourth Street.

NEW YORK, 1200 tons, office building at 29 West Forty-seventh Street.

NEW YORK, 500 tons, for finishing first section of West Side elevated highway, inquired for by James Stewart & Co.

CENTRAL ISLIP, N. Y., 2000 tons, 11 hospital buildings.

FLUSHING, N. Y., 200 tons, building for Antlers Club.

CAMDEN, N. J., 300 tons, club house for Loyal Order of Moose; J. M. Yardley, Philadelphia, general contractor.

PHILADELPHIA, 250 tons, stores in Upper Darby.

FREDERICKSBURG, TEX., 300 tons, highway bridge.

MILWAUKEE, 1850 tons, addition to Post Office; Ralph Solitt Construction Co., 228 No. La Salle St., Chicago, low bidder on general contract, including steel work.

WAUSAU, WIS., 370 tons, Marathon City bridge; Wausau Iron Works, low bidder.

MILWAUKEE ROAD, 300 tons, I-beam spans.

MANTENO, ILL., 500 tons, dining and ward buildings for State institution; bids rejected on account of lack of funds.

KEWANEE, ILL., 300 tons, building for Walworth Co.

JEFFERSON CITY, MO., 125 tons, 67 trusses for storage buildings, for Missouri Highway Commission.

ABERDEEN, WASH., 250 tons, plates, three tanks totaling 50,000 bbl. for Sunset Pacific Oil Co.; bids being taken.

SEATTLE, 400 tons, shop building for naval air station; general contract to Fitton & Livergreen.

LONG BEACH, CAL., 970 tons, auditorium; general contract awarded, steel not yet placed.

OAKLAND, CAL., 242 tons, transit shed for Port Commission; Herrick Iron Works, low bidder.

SACRAMENTO, 350 tons, live stock building for State; Judson-Pacific Co., low bidder.

The Copperweld Steel Co. is completing a $50,000 wire research laboratory building at its Glassport, Pa., plant.

PERSONAL

JAMES J. JORDAN has been made second vice-president of the Cushman Chuck Co., Hartford, Conn.; A. BOYD SLOAN, treasurer; HARRY W. HULTGREN, assistant secretary, and EDWARD L. FIELD, assistant treasurer. In addition, the personnel of the company includes A. P. SLOAN, chairman of the board, and H. E. SLOAN, president.

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HENRY E. HILL, purchasing agent of North & Judd, New Britain, Conn., has resigned to become associated with Beardsley & Wolcott Co., Waterbury, Conn.

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H. H. ASHDOWN, formerly connected with several British steel companies, such as Thomas Firth & Sons, Ltd., Sheffield; Armstrong-Whitworth & Co., Ltd., Newcastle, and Vickers Armstrong, Ltd., Manchester, as a metallurgist and engineer, has located, probably permanently, in the United States. His present address is Allerton House, 45 East Fifty-fifth Street, New York.

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C. BRIGHAM ALLEN, JR., has been appointed district sales representative of the Philadelphia office of the Reliance Electric & Engineering Co., Cleveland.

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S. W. CASE has become district manager of the Los Angeles sales and service office of the Bristol Co., Waterbury, Conn., and W. H. ROGERS, sales and service engineer.

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C. M. STEVENSON has been appointed sales manager of the St. Louis district office, at 712 Cass Avenue, by the Colonial Steel Co. and Vanadium-Alloys Steel Co., Pittsburgh.

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A. B. HARPER, who has been with the Carnegie Steel Co. for 25 years, and for the past 13 years as assistant manager of sales in the Detroit district, has become identified with the Bopp Steel Corporation, Detroit, in an executive capacity with the new cold-rolled strip steel mill to be placed in operation early in April and will assist Mr. Bopp in the sales department.

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CLARENCE M. DAY has resigned as general manager of the Jackson Steel Products division of the General Motors Corporation, effective May 1. He has been associated for more than 20 years with ALFRED P. SLOAN, JR., president, General Motors Corporation, and became general manager in 1918 of the Pearlman Rim Co., which later became the Jackson Steel Products Co.

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J. G. PEARCE, director, British Cast Iron Research Association, will address the April meeting of the Detroit Foundrymen's Association, which has been postponed until May 2, at the Masonic Temple, Detroit.

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F. A. LORENZ, JR., heretofore assistant vice-president in charge of operations at the Indiana Harbor works of the American Steel Foundries, Chicago, has been appointed general manager, Indiana Harbor and Pittsburgh works, in charge of sales and production. He has held the positions of assistant to the fourth vice-president and works manager at the Indiana Harbor works.

F. A. LORENZ, JR.

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EDWIN N. HAZLETT has joined the sales engineering department of the Copperweld Steel Co., Glassport, Pa.

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R. H. MCGREDY has become identified with the New York office of the Harnischfeger Sales Corporation, Milwaukee.

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JOHN L. CONNORS has been elected vice-president and a director of the Jeffrey Mfg. Co., Ltd., Montreal, and R. H. Ross has been made secretary-treasurer to fill the vacancy caused by the resignation of F. N. DIEHL, former secretary.

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J. EDWARD GRINFIELD-COXWELL, of Boston, who acts as special agent for several steel mills, has sailed for London on a short business trip. Mr. Coxwell's address while in London will be in care of Brown, Shipley & Co.

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H. H. HARRIS, president, General Alloys Co., Boston, and partner of Noble & Harris, consulting engineers, Detroit, has returned from an airplane tour of Mexico in his own airplane as the guest of General Juan Andreu Almazan, secretary of communications and public works of the Republic of Mexico. Accompanying Mr. Harris was Roberto Riveroll, agent of the Banco de Mexico of New York, and Charles T. Stork, president of Aviation Consolidated. This group conducted a general engineering survey of many projects of the new Mexican Government for General Almazan and President Rubio, and will return to Mexico with additional staff in the near future to complete the work.

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JOHN BODE, recently identified with the Wellman Engineering Co., Cleveland, has become associated with the sales department of the Aetna-Standard Engineering Co., Youngstown. Before going with the Cleveland company, Mr. Bode was engineer of the Mackintosh-Hemphill Co., Pittsburgh.

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JOSEPH THOMPSON has resigned as general manager of the Hammond, Ind., plant of the Standard Steel Car Co. He is at present at Phoenix, Ariz., where he hopes to improve his health. Mr. Thompson had been at the Hammond plant for 23 years during which time he served in practically every department. He was appointed manager of the plant about two years ago.

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SAMUEL MATHER, Pickands, Mather & Co., and WILLIAM G. MATHER, Cleveland-Cliffs Iron Co., Cleveland, sailed March 20 on the France for a six weeks' trip abroad. Morocco is included in their itinerary.

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E. C. HUMMEL has resigned as manager of the Lakeside works of the Otis Steel Co., Cleveland.

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ALBERT ROELLECKE, formerly of the New York office of Otto Wolff & Co., and later vice-president, Steel Union Co., Inc., 17 John Street, New York, the American office of the Vereinigte Stahlwerke A. G., Düsseldorf, Germany, has resigned and is returning to Germany March 27, where he will be connected with the Haleberger Huette, Brebach on the Saar, maker of cast iron pipe and fittings.

—

W. E. BERG, who will retire on Sept. 1 from the Colorado Fuel & Iron Co. after 27½ years of service, as already mentioned in these columns, was chief engineer from 1913 to 1926 besides being chief engineer of the water department of the company from June, 1915, to the present time.

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V. B. BROWN, F. H. STEPHENS, W. F. DETWILER and P. F. VOIGHT, JR., have been elected vice-presidents of the Allegheny Steel Co., Brackenridge, Pa. Mr. Brown has been assistant to the president; Mr. Stephens, secretary and assistant treasurer; Mr. Detwiler, general manager, and Mr. Voight, general sales manager.

WILLIAM MIRGELER, a salesman in the Detroit district for the Kearney & Trecker Corporation, Milwaukee, has been appointed director of sales engineering for all Europe. He will sail April 28 and will make his headquarters at Paris. He succeeds FRANK RIFFLE, who has been in Europe for two years and will now return to this country to become manager of the Chicago office.

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JAMES N. HEALD has been made president of the Heald Machine Co., Worcester, Mass., manufacturer of grinding machines, succeeding JOHN W. HARRINGTON. Mr. Heald was the treasurer of the company, which office he has held since the business was incorporated. He has been succeeded in that office by his son, RICHARD A. HEALD. Another son, ROGER N. HEALD, is vice-president. The three, with PAUL B. MORGAN, president of the Morgan Construction Co., and Mr. Harrington, treasurer of the Harrington & Richardson Arms Co., constitute the board of directors. Mr. Heald also holds the office of general manager, and SILAS C. MASSEY is the assistant general manager. The two sons of James N. Heald are of the fourth generation of ownership of the business, in the same name and family. It was established in Barre, Mass., in 1826 by Stephen Heald. He was succeeded in ownership and management by his son, LEANDER I. HEALD, who is still living in Worcester in his 95th year. From him the control passed to his son, James N. Heald, under whose management it has made great growth in the design and building of internal grinding machines. Now the fourth generation is taking important part in the conduct of the business.

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JAMES T. HANLEY, vice-president, American System of Reinforcing, Chicago, has been elected a trustee of the University of Illinois from the alumni group.

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LOUIS H. COSTALEN, who has been made a director of the Indian Motocycle Co., is to serve the company as consulting engineer.

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E. C. BULLARD, J. W. BRAY, sales manager, and T. E. DUNN, works manager, have been added to the board of directors of the Bullard Co., Bridgeport, Conn.

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R. B. WILFONG has become associated with the Pittsburgh Tube Co., Vandergrift Building, Pittsburgh, in charge of standard pipe sales. The company's plant at Monaca, Pa., to produce this pipe, is rapidly nearing completion.

Leeds & Northrup Co., 4901 Stenton Avenue, Philadelphia, has moved its Cleveland office to 1941 Union Trust Building.

Richards Memorial Lecture Fund Started

A fund has been established by the board of directors of the American Electrochemical Society for a memorial lecture in honor of Joseph W. Richards, the first president and for many years secretary of the society. An initial subscription of $1,000 has been received by Dr. E. G. Acheson toward the fund, the interest of which is to be used in meeting "the expenses incurred by inviting and entertaining distinguished scientists from foreign countries."

Professor Richards died suddenly Oct. 12, 1921, respected and loved by a world-wide circle of friends and by the alumni of his alma mater, Lehigh University, where he had taught for 35 years, as well as by numerous scientific societies of which he was an enthusiastic member. The goal set by the fund committee is $30,000 in order that the society may be honored by the visit of a prominent foreign scientist, at least once a year, at the spring convention.

It is believed that Doctor Richards' many friends will welcome the opportunity of subscribing to the fund which will be deposited with one of the large trust companies and administered by the board of directors of the society. To anyone to whom this memorial appeals, a subscription is solicited. Already a large number of individuals and organizations have sent in subscriptions which will be received in amounts ranging from $1 up. These can be sent to the secretary of the society, Dr. Colin G. Fink, professor of electrochemistry, Columbia University, New York.

Why Not Profits in Foundries?

(*Concluded from page* 937)

minds that is reflected in improved conditions on their floors. Such improvement means a reduction in expense, amounting to a sizable sum yearly in large plants.

Lack of Accurate Cost Data

Several times during the last few years the American Foundrymen's Association has attempted to awake an appreciation on the part of foundrymen as to the vital need for satisfactory cost practice. One questionnaire issued to the trade, which was answered by about 1200 foundry operations, indicated that 440 had dependable cost data, while 590 were entirely lacking in this essential information.

The Philadelphia Foundrymen's Association recently arranged to have an inquiry sent out for a number of gray iron castings, on which necessary physical data were given, and asked its members to fill out the cost data based on their own foundry practices. These data were detailed as molten metal, molding, coremaking and cleaning. The costs reported varied from 3½c. to 12c. a lb. It was evident that many of these foundries had no real knowledge of the actual cost of making the castings.

It is usually the foundry lacking in accurate costs data that is most guilty of price cutting. There are usually two different classes of foundries engaged in taking work at low prices. One class consists of foundries that possess no satisfactory cost methods and take work on an average price basis, without any relation to the weight, molding, coremaking and other factors that have to be considered in setting a fair billing quotation. In the other class are foundries who are selling castings in some cases at less than the others' costs and are making a good profit. They furnish good castings at prices lower than the average foundry can make them because their foundries are modern in every particular.

Obituary

DAVID P. THOMPSON, assistant to the president and a director of the Inland Steel Co., died at Miami Beach, Fla., March 24, of pneumonia. He was born in 1880 at New Castle, Pa., the son of Alexis W. Thompson, who at one time was president of the Republic Iron & Steel Co. and later president of the Inland Steel Co. After Mr. Thompson's graduation from Yale University, he entered the employ of the Republic company. Later he became president of the Sharpsville Furnace Co., Sharon, Pa. He was identified with the Inland Steel Co. in 1912 and at the time of his death was assistant to the president in charge of operations.

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JAMES D. COWAN, secretary and treasurer of the National Lock Washer Co., Newark, N. J., died on Feb. 26.

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HENRY DISSTON, assistant to the superintendent of the plant of Henry Disston & Sons, Inc., Philadelphia, died suddenly at his home in that city on March 19, aged 85 years. He was born in Nottingham, England, and came to this country 36 years ago. He was a nephew of the founders of the company.

Ship Contracts Call for 30,000 Tons of Steel

WASHINGTON, March 25. — Ocean mail contracts awarded last Friday by Postmaster-General Brown call for the construction of 14 ships of 91,000 gross tons and will entail steel requirements of approximately 30,000 tons. The contracts were awarded to the United Fruit Co., which will build eight 6000-ton ships; the Roosevelt Steamship Co., which will build five 7000-ton ships, and the Grace Lines, which will build one 8000-ton vessel. The Roosevelt contract also carries a provision for two additional 18-knot ships of 12,000 tons each to be built within five years at the option of the Postmaster-General.

Improvement Slow in European Markets

Pig Iron Demand Up with Lower British Prices—German Output Slackens—Export Requirements Small—Luxemburg Had Good Year

(*By Cable*)

LONDON, ENGLAND, March 24.

PIG iron demand has improved following a price reduction by Cleveland furnaces and some fair business is reported, but a large increase in buying will be necessary to prevent further suspension of blast furnaces.

Dorman, Long & Co. have blown out the Clarence works blast furnace, as stocks of iron are still heavy as a result of reduced demand from the steel works.

Hematite iron makers and merchants are competing for orders and prices are declining, although East Coast makers claim that the producers' price is not less than £4 ($19.46) per ton. The ferromanganese export price has eased in sympathy with the decline in the domestic market and is now quoted at £11 to £11 15s. ($53.53 to $57.17) per ton, according to destination.

The Steel Makers' Association has reaffirmed heavy steel prices and inquiry is improving, but business is still slow, especially for export. Recently awarded ship contracts will eventually benefit the steel mills. Meanwhile works are finishing current contracts without adequate replacements of tonnage.

Tin plate prices are steady, most mills having agreed to quote not less than 18s. 3d. ($4.43) per base box, f.o.b. works port, although the official minimum is still 18s. ($4.37) per base box. Business is quiet, but inquiry is broadening and expansion of demand is expected if the price of tin maintains its present upward tendency. Mills are generally well engaged and, while production is restricted, current output is at a high level per mill per week, averaging more than 1000 boxes.

Galvanized sheets are quiet. Black sheets are inactive with Far Eastern demand small.

Continental markets are dull and British consumers of semi-finished material are burdened with heavy stocks and seeking suspension of deliveries. General export demand is poor on uncertainty of developments in the Continental steel cartel.

The Vulcan Foundry, Ltd., has secured an order for 20 locomotives from the Buenos Aires & Great Southern Railroad. The International Rail Makers' Association has reaffirmed prices and will hold its next meeting in London, June 19. The Continental Steel Cartel will meet at Liège, Belgium, March 29, to discuss the establishment of export sales offices.

The Assouan dam stainless steel order was placed with A. Johnson & Co., London, representing the Avesta Jernverks Aktiebolag.

German Steel Business at Low Level

BERLIN, GERMANY, March 8.—Domestic steel business is quiet and, although rolling mills have curtailed operations, stocks are accumulating. In the past fortnight some substantial orders, which had been delayed until negotiations for syndicate renewals were concluded, were placed, but actual specifications against contracts are slow.

This slackness in the steel business is attributed to various causes. Despite an easy money market, both industrial building and construction of apartments and dwellings are at a low level. Industrial building lags because there is no need for further expansion, and construction of dwellings is delayed by uncertainty of the Government's intentions about the tenant protection laws. Recent orders from the Railroads Corporation have been unusually small.

Export business has shown some improvement, but advances in export prices have caused many foreign consumers to delay buying as long as possible. Export quotations on medium and light sheets, f.o.b Hamburg, are from 1s. 3d. to 5s. (30c. to $1.22) per ton higher than a month ago.

Foreign Capital Controls 78 German Companies

HAMBURG, GERMANY, March 8.—A total of 78 iron, steel, non-ferrous metal and hardware manufacturing companies in Germany were controlled by American, British or Swedish capital at the end of 1929. The total capital investment in these companies was 320,000,000 m. ($76,480,000). American capital is invested in lock and hinge manufacturing companies, British capital in the copper and wire industries, and Swedish capital in the ball and roller bearing and horseshoe nail industries.

British and Continental European Export Prices per gross ton, f.o.b. United Kingdom Ports, Hamburg and Antwerp, with the £ at $4.8665 (par)

British Prices f.o.b. United Kingdom Ports

Ferromanganese, export	£11	0s.	to	£11	15s.	$53.53	to	$57.17
Billets, open-hearth	6	2½	to	6	12½	29.81	to	32.24
Black sheets, Japanese Specifications	12	5				59.61		
Tin plate, per base box	0	18¼	to	0	18¾	4.43	to	4.55
						Cent a Lb.		
Steel bars, open-hearth	8	0	to	8	10	1.74	to	1.85
Beams, open-hearth	7	7½	to	7	17½	1.60	to	1.71
Channels, open-hearth	7	12½	to	8	12½	1.66	to	1.87
Angles, open-hearth	7	7½	to	7	17½	1.60	to	1.71
Black sheets, No. 24 gage	9	15	to	10	0	2.12	to	2.17
Galvanized sheets, No. 24 gage	11	17½	to	12	5	2.57	to	2.60

Continental Prices, f.o.b. Antwerp or Hamburg

Foundry iron, 2.50 to 3.00 per cent sil., 1.00 per cent and more phos.	£3	2s.	to	£3	4s.	$15.08	to	$15.57
Billets, Thomas	4	13	to	4	14	22.63	to	22.87
Wire rods, low C., No. 5 B.W.G.	6	2	to	6	4	29.69	to	30.19
Rails, light	6	0				29.20		
						Cents a Lb.		
Steel bars, merchant	5	7½				1.18		
Steel bars, deformed	5	6½	to	5	7½	1.17	to	1.18
Beams, Thomas, British standard	5	3	to	5	6	1.12	to	1.17
Channels, Thomas, American sections	5	11	to	5	14	1.23	to	1.26
Angles, Thomas, 4-in. and larger, over ⅜-in. thick	5	6				1.17		
Angles, Thomas, 3-in.	5	7½				1.18		
Black sheets, No. 31 gage, Japanese	12	1	to	12	3	2.66	to	2.68
Hoop and strip steel over 6-in. base	5	17½				1.25		
Wire, plain, No. 8 gage	6	10	to	6	17½	1.42	to	1.50
Wire, barbed, 4-pt. No. 12 B.W.G.	10	15				2.33		
Wire nails, base	6	15				$1.47 a keg		

Open-Hearth Steel for Export Is Tested

HAMBURG, GERMANY, March 8.—Steel mills have rather generally adopted the practice of supplying all buyers of open-hearth structural shapes, especially when intended for bridge construction, with certificates of physical qualities, such as tensile strength, elongation and Brinell hardness.

Inspection is by metallurgists not connected with the mills, such as testing laboratories, privately operated or in universities. It is believed that this practice will increase exports, as ordinarily such certificates of inspection are furnished only on request.

Luxemburg Steel Output Up in 1929

WASHINGTON, March 22.—Despite a reduced world demand, and in the face of the 10 per cent reduction in quotas by the International Steel Cartel, preliminary figures indicate that output of pig iron in Luxemburg in 1929 increased to 2,906,093 metric tons from 2,770,061 tons in 1928, while the production of steel ingots advanced to 2,702,257 tons from 2,567,079 tons, according to a report to the Department of Commerce from Luxemburg.

Average Iron Content of Lake Ore Rose in 1929

The average iron content of Lake Superior ore, which has shown a slight but rather steady decline during recent years, was a trifle higher in 1929 than during the previous year, according to an annual report of the Lake Superior Iron Ore Association. The content last year was 51.18 per cent iron natural, compared with 51.15 per cent during 1928. Ten years ago, or in 1920, the average iron content was 51.69 per cent.

The report includes tables showing the iron, phosphorus, silica, manganese and moisture content for all grades of ore and for all ranges for a 10-year period. The content of other elements showed little change from the previous year. Phosphorus increased to 0.100 per cent, compared with 0.099 per cent, and silica to 8.48 per cent, compared with 8.43 per cent during the previous year. The content of manganese was a little less, being 0.80 per cent as compared with 0.85 per cent the year before. The moisture content declined, being 11.24 per cent as against 11.37 per cent the previous year.

Low phosphorus non-Bessemer ore comprised 63 per cent of the total shipped last year or a gain of 0.9 per cent over the previous year, its percentage of the total being larger than during any previous year covered by the report. This ore had an iron content of 50.73 per cent last year, compared with 50.80 per cent the previous year. The decline on this grade in the Mesabi district, which shipped nearly 75 per cent of the total low phosphorus ore, was to 50.03 per cent, compared with 50.12 per cent the year before. This was the lowest for the 10-year period. In 1920 it was 50.63 per cent.

Bessemer ore had an iron content of 54.57 per cent last year, compared with 54.56 the year before. High phosphorus non-Bessemer ore showed an iron content of 51.22 per cent last year as against 51.16 in 1928. The iron content of manganiferous ore was 43.18 per cent as against 42.76 per cent the year before. Silicious ore made a better showing than the previous year, its iron content being 37.39 per cent against 35.89 in 1928.

Taking all grades of ore by ranges, that mined in the Mesabi district decreased in iron content to 51.19 per cent from 51.28 per cent the year before. There was also a decrease in the Menominee range to 50.42 per cent from 50.79 per cent the year before. But all the other ranges showed a slight increase. The ore in the Gogebic range ran 52.49 per cent iron as against 52.28 per cent the year before. That in the Marquette range was 50.47 per cent as compared with 49.81 per cent in previous year. The Vermilion range rose to 58.59 per cent from 58.16 per cent the year before, and the Cuyuna jumped to 44.71 per cent from 43.24 per cent in 1928.

Production, Shipment and Orders for Fabricated Steel Equipment—

	February, 1930	January, 1930	February, 1929
Steel furniture orders(a)	$2,385,053	$2,298,735(b)	$3,109,067
do. shipments	2,485,554	2,883,333	3,287,818
do. unfilled orders	1,771,145	1,798,624	2,418,877
Steel shelving orders(a)	750,062	707,719(b)	919,557
do. shipments	667,629	659,174	974,305
do. unfilled orders	776,797	696,647	765,541
Steel boilers ordered(a)	881	942	1,042
do. heating surface, sq. ft	934,872	1,081,749	1,196,380
Steel barrels produced(a)	604,709	582,407	567,398
do. shipments	599,324	574,763	563,532
do. unfilled orders	1,591,927	1,408,511	1,543,846
do. operating rate, per cent	46.7	48.7	47.6
Mechanical stokers sold(a)	73	53	80
do. total hp	22,648	13,198	31,554

(a) United States Department of Commerce.
(b) Lowest in more than a year.

Further Drop in Wholesale Commodity Prices

The February index of wholesale commodity prices of the United States Bureau of Labor Statistics is 92.1, compared with 93.4 in January and with 96.7 in February, 1929. The indexes are based on 550 different commodities, with their average prices in 1926 as 100. Every one of the 10 major groups showed a drop from January, and five of them showed a sharp drop.

Metals and metal products had only a fractional decline, from 101.2 to 100.9. This was accounted for by recessions in the iron and steel and the non-ferrous metals components, while agricultural implements, automobiles and other metal products underwent no change. The structural steel element in the building material group declined to 91.9 from 97 a month earlier.

Nine of the 10 major groups were lower in February than they were a year before. The only exception was housefurnishing goods, which had a fractional increase.

German Zinc Maker Reaches 225th Year of Business

HAMBURG, GERMANY, March 1.—The Giesches Erben A. G., one of the largest zinc producers in Germany, which is now controlled by the Harriman interests, reached its 225th year of business last week. The oldest non-ferrous metal producing company in Germany is the Mansfeld A. G., smelter of copper and other metals, which was established in the thirteenth century and remained under the control of the same family for more than 500 years, after which it was reorganized as a corporation.

Aluminum Case Set for Argument April 1

WASHINGTON, March 21.—Dealing with contracts and agreements made by the company for the sales of sheet aluminum, the final argument in the proceedings against the Aluminum Co. of America has been set by the Federal Trade Commission for April 1, at Washington. The proceedings are based on both the Clayton and Federal Trade Commission acts.

Steel Supports in Mines

HAMBURG, GERMANY, March 1.—The use of steel timbering instead of wood in Westphalian and Rheinish coal mines has been increasing rapidly in the past few years. No statistics are available for steel timbering in use in 1913, but in 1925 only 8 per cent was of steel and in 1929 17 per cent.

Reeves Brothers Co., Alliance, Ohio, has changed its name to A. G. Reeves Steel Construction Co.

Western Metal Congress Next February

The second biennial National Western Metal Congress and Exposition will be held in the Civic Auditorium at San Francisco, the week of Feb. 16, 1931.

A general committee of four, headed by Ivan L. Johnson, superintendent, Best Steel Casting Co., Oakland, Cal., has been formed to handle the local arrangements. The other members are Frank B. Drake, president, Johnson Gear Co., Berkeley, Myron Bird, vice-president, California Saw Works, San Francisco, and R. S. Hirst, Hall-Scott Motor Car Co., Berkeley.

Western sections of twelve national societies will cooperate with the American Society for Steel Treating in arranging the technical programs and organizing the exhibition. Floor plans of the auditorium are now in preparation and when completed will be mailed to exhibitors by W. H. Eisenman, secretary American Society for Steel Treating.

The first National Western Metal Congress and Exposition was held at the Shrine Auditorium, Los Angeles, in January, 1929. At that time a total of 176 companies exhibited.

Duty Reductions by Poland on Machinery Discontinued

Special duty reductions, granted on the basis of licenses issued by the Polish Minister of Finance on the importation into Poland of machinery and equipment not manufactured in Poland, which amounted, effective Jan. 1, 1930, to 35 per cent of the normal tariff rate, are discontinued for an indefinite period, according to a radiogram received by the Department of Commerce.

By-Product Coke Made at Higher Rate

WASHINGTON, March 22.—Due largely to an improvement in the iron and steel industry, the daily rate of by-product coke production showed further signs of recovery during February, according to the Bureau of Mines. The month's output was 4,004,217 tons, with a daily rate of 143,000 tons, against 4,195,674 tons in January, or at the daily rate of 135,344 tons. February, 1929, by-product production was 4,089,710 tons, reflecting a daily rate of 146,061 tons.

With beehive coke output amounting to 274,800 tons in February, 1930, the total coke production for that month was 4,279,017 tons. January production of beehive coke was 309,200 tons, the total coke output being 4,504,874 tons.

Stocks of by-product coke at furnace plants on March 1 were 1,037,798 tons, against 1,049,273 tons on Feb. 1. Stocks at these plants on March 1 of last year totaled 615,230 tons. Stocks at other plants were 805,556 tons on March 1, 885,166 tons on Feb. 1, 1930, and 442,229 tons on March 1, 1929.

More Steel Castings Being Made

WASHINGTON, March 21.—Orders for commercial steel castings in February totaled 114,664 tons, or 79 per cent of the monthly capacity of the manufacturers reporting to the Department of Commerce. They were the highest since last October, with a total of 136,221 tons, or 94 per cent of capacity, and exceeded by 13,021 tons orders for January, when operations were at the rate of 70 per cent of capacity. Orders in February of last year totaled 115,639 tons.

Production in February was 107,657 tons, against 109,220 tons in January, and 97,568 tons in February of last year. The rate of operation in February was 74 per cent of capacity, against 76 per cent in January and 67 per cent in February, 1929. Orders in February consisted of 53,901 tons of railroad specialties and 60,763 tons of miscellaneous castings. Production comprised 43,352 tons of railroad specialties and 64,305 tons of miscellaneous castings.

Tri-Cities Lose Appeal for Alternative Rates

WASHINGTON, March 24.—In a decision made public on March 17, the Interstate Commerce Commission denied the application of interests in the tri-cities of Davenport, Iowa, and Rock Island and Moline, Ill., for alternative rates on bars, plates and shapes subject to a carload minimum of 80,000 lb. The application, made by the chambers of commerce of Davenport and Rock Island and Deere & Co., Moline, implement manufacturers, urged that the rate on the products with the minimum carloading indicated should not exceed 75 per cent of the rates maintained on other iron and steel articles. The case was part of the general iron and steel rate case concerning rates on all manufactured iron and steel products throughout official classification territory and was reopened to hear the application made by the Tri-Cities.

The decision in the general case set up a mileage scale with a minimum carloading of 40,000 lb. Had the application for 75 per cent of the rates prescribed been applied, the tri-cities would have been given a rate of 16.5c. on bars, shapes and plates from the Chicago district, its chief source of supply, as against the rate of 19.5c. per 100 lb., minimum 40,000 lb., which will prevail under the general rate decision, effective on May 20, 1930, except as to cast iron foundry annealing pots, on which the new rates became effective on Thursday of last week.

The present rate on bars, shapes and plates from Chicago to the tri-cities is 17c., minimum 36,000 lb. The commission upheld the contention of the carriers in their opposition to the alternative rates that the revenues derived from their steel traffic should be maintained. The commission added that, with exceptions, it has looked with disfavor upon the establishment of alternative rates.

More Industrial Electrical Energy in February

Consumption of electrical energy by manufacturing plants in February is reported by *Electrical World* at 123.5, compared with 121.8 in January, both based on 100 as the monthly average in 1923-1925. The improvement was not uniformly distributed.

Consumption by the metal industries group went up a little more than the average, having been 135 in February against 132.9 in January. Metal-working plants provided all of this increase, for the rolling mills and steel plants showed a fractional decrease.

Other industries showing improvements were automobile, including parts, which advanced to 116.6 from just below par; shipbuilding, which went up one point to 125.4; chemicals, rubber, paper and pulp and forest products. Decreases were recorded by leather, textiles, stone, clay and glass and food and kindred products.

Henry N. Muller Co., First National Bank Building, Pittsburgh, has been appointed district sales agent in western Pennsylvania, eastern Ohio, and West Virginia for the Roller-Smith Co., New York.

Mechanical Equipment Sales in February

	February, 1930	January, 1930	February, 1929
Foundry equipment orders(a)	196.4	160.1	197.0
do. shipments	169.6	223.6(b)	214.8
do. unfilled orders	424.7	395.6(c)	321.3
Mechanical stokers sold(d)	73	53	80
do. hp.	22,648(e)	13,198	31,554

(a) Foundry Equipment Manufacturers' Association; reported in index numbers based on 100 as average monthly shipments in 1922-1924.
(b) Highest since December, 1928.
(c) Lowest since last July.
(d) United States Department of Commerce.
(e) Lowest (except for January) since November, 1927.

Machinery Markets and News of the Works

Some Gains in Sales

Machine Tool Demand Better in Cincinnati District—Little Change Elsewhere

MACHINE tool builders in the Cincinnati district report an upturn in sales during the past week, particularly of lathes and cutter grinders, but elsewhere there has been little change.

Some of the largest business of the week was placed by the Amtorg Trading Corporation, New York, official buyer for the Soviet Government. It placed an order with a Cincinnati builder for 13 tools and with a Massachusetts maker of boring mills for 12 machines.

The spotty condition of business is illustrated by the fact that a leading Eastern dealer in machine tools had the best week of the year, but other dealers operating in the same territory were unable to see any improvement.

There is disappointment in the machine tool trade that the large volume of inquiries on which quotations have been made since the first of the year has resulted in so little buying. In most instances, the specific reason for this is that manufacturers are not ready to make the necessary expenditures until their own businesses show a more decided uptrend.

The Cleveland market is dull because of the small amount of business coming from makers of automobiles and parts and accessories. Buying has been fairly good in the Chicago district in the past few weeks, but inquiries there are falling off. In general, it may be said that the outlook for the immediate future is still uncertain.

The American Bridge Co. was one of the largest domestic buyers of the week, placing orders for a number of radial drills for its various fabricating shops.

New York

NEW YORK, March 25.—A moderate gain in buying of machine tools the past week is reported in some quarters. One company had the largest business for any week this year. In general, however, no marked improvement is seen, despite the fact that a great amount of business is pending. Many manufacturers who acknowledge the need of the tools they have recently inquired for are taking the position of making no appropriations for replacements so long as present equipment is far beyond their present needs. One purchaser, whose plans are naturally not affected by the business outlook in this country, is the Amtorg Trading Corporation, official machinery buyer for Soviet Russia, whose outlay already this year has totaled a substantial amount. This company's program calls for further expenditures during the year amounting to millions of dollars for machine tools alone.

American Can Co., 230 Park Avenue, New York, has awarded general contract to A. W. Quist & Co., Hoge Building, Seattle, for two and three-story plant, 140 x 550 ft., on Railroad Avenue, Seattle, with loading and distributing pier, 170 x 600 ft., to cost about $1,000,000, of which equipment installation will represent about $250,000. Engineering department of company is in charge.

I. Kallich, 26 Court Street, Brooklyn, architect, has revised plans for a three-story automobile service, repair and garage building on Quentin Road, to cost about $100,000 with equipment.

Marine Works, 7 Front Street, New York, ship equipment, has purchased two-story building, 50 x 75 ft., at 237-39 Water Street, for expansion.

Stephens Fuel Co., Inc., 220 East 138th Street, New York, plans rebuilding coal storage and distributing plant, including boiler plant, overhead coal pockets, etc., destroyed by fire March 19.

Delaware, Lackawanna & Western Railroad Co., 90 West Street, New York, has arranged for expansion and improvements to cost about $20,000,000 during year, of which about $16,000,000 will be used for electrification work on suburban lines in New Jersey to Morristown, Montclair and vicinity, on which initial construction is under way.

William L. Hohanser, Inc., 15-17 West Forty-fourth Street, New York, architect, will soon take bids on general contract for a one-story automobile service, repair and garage building, to cost about $150,000 with equipment.

O'Connor Transatlantic Airways, Inc., 192 Broadway, New York, is planning construction of new terminal on City Island, including hangars, repair shops, oil storage and other field units, to cost over $500,000 with equipment.

Spreckels Sugar Corporation, 82 Wall Street, New York, has leased property adjoining its plant at Yonkers, N. Y., and plans expansion to cost over $150,000.

Becker & Levy, 349 East 149th Street, New York, architects, have awarded general contract without competition to Indiana Building Corporation, 1154 Ward Avenue, for six-story automobile service, repair and garage building, to cost more than $225,000 with equipment.

New Kanawha Power Co., 30 East Forty-second Street, New York, an interest of Union Carbide & Carbon Corporation, same address, has awarded general contract to Rinehart & Dennis, Inc., Charlottesville, Va., for a hydroelectric power project on New River near Gauley, W. Va., to cost over $4,000,000 with transmission system. Output will be used largely for service at chemical and metallurgical plants of parent company and other subsidiaries at Carbide, Diamond and South Charleston, W. Va., and vicinity.

Public Service Electric & Gas Co., Public Service Terminal, Newark, will proceed with new power substations at Van Buren and Chestnut Streets, to cost about $700,000 with equipment, and on Belleville Turnpike, North Arlington, to cost $450,000. Artificial gas division is planning for new pumping stations at West End gas works, Jersey City, and at New Durham, to cost over $100,000 with machinery. Work will be carried out under direction of Public Service Production Co., an affiliated organization. Company has acquired property near Port Reading, N. J., and is contemplating plant for manufacture of motor bus bodies at that location.

Driver-Harris Co., Middlesex Street, Harrison, N. J., manufacturer of wire products, is considering call for bids in about 30 days for one and two-story addition, to cost over $200,000 with equipment. Joseph A. Finegan, 776 Broad Street, Newark, is architect.

Ford Motor Co., Dearborn, Mich., is awarding sub-contracts for work for new two-story assembling plant, 360 x 1500 ft., at Edgewater, N. J., including power house, 50 x 113 ft., and other units, to cost over $1,500,000 with machinery. General contract has been let to Turner Construction Co., 420 Lexington Avenue, New York. Albert Kahn, Inc., Marquette Building, Detroit, is architect and engineer.

Commercial Steel Equipment Co., 1024 Elizabeth Avenue, Linden, N. J., has plans for a one-story addition, to cost over $35,000 with equipment. A. J. Silberstein, 868 Broad Street, Newark, is architect.

City Commission, Perth Amboy, N. J., is asking bids until April 2 for an incinerating plant, to cost $130,000 with machinery. Plans and specifications at office of Louis P. Booz, City Hall, city engineer.

South Atlantic

BALTIMORE, March 24.—Ditch, Bowers & Taylor, Inc., Mount Royal and North Avenues, Baltimore, operating an automobile service and repair works, including electric and carbureter departments, is considering new three-story plant unit to replace structure recently destroyed by fire, to cost $125,000 with equipment. W. E. McGrath is secretary.

Board of Baltimore County Commissioners, Towson, Md., is planning an electric-operated pumping plant at Catonsville, to cost about $35,000 with equipment. Harrison Rider, Court House, Towson, is county engineer.

Jones Hollowware Co., Forrest and Eager Streets, Baltimore, manufacturer of cast iron plumbing specialties, including basins, drains, etc., is arranging to discontinue foundry at local State penitentiary, using prison labor, and will concentrate production at new foundry at York, Pa., for manufacture of additional specialties.

American Oil Co., American Building, Baltimore, has acquired properties of Penn Oil Co., Washington, including storage and distributing plant, for about $3,750,000, and will operate as unit. Increased facilities are being considered for District of Columbia, Maryland and Virginia. Purchasing company is affiliated with Pan-American Petroleum & Transport Co., 122 East Forty-second Street, New York.

Beeler Blevins Aviation School, Candler Field, Atlanta, Ga., has plans for rebuilding hangar with repair and reconditioning facilities, recently destroyed by fire, to cost close to $40,000 with equipment.

Grinnell Co., Inc., Providence, R. I., manufacturer of fire extinguishers, fire sprinkler systems, etc., has awarded general contract to Gaston Construction Co., Gastonia, N. C., for one-story branch factory and distributing plant at Charlotte, N. C., including assembling, pipe-cutting and threading, and other mechanical departments, to cost over $125,000 with equipment. J. E. Sirrine & Co., 215 South Main Street, Greenville, S. C., are architects and engineers.

Seaboard Air Line Railway, Savannah, Ga., is considering new engine house and repair shop at Monroe, N. C., to cost over $50,000 with equipment. W. D. Faucette, Savannah, is chief engineer.

May Oil Burner Corporation, 906 North Charles Street, Baltimore, manufacturer of oil burners and equipment, has leased property at 200 Adelaide Street, Toronto, for a new branch plant. Company has organized May Oil Burner of Canada, Ltd., a subsidiary, to carry out production. E. T. Whitall is vice-president and managing director of new organization.

Water Department, Norfolk, Va., W. L. Davis, superintendent, is planning electrification of pumping plant used for municipal waterworks, replacing all present steam-operated equipment.

Board of Education, Salisbury, Md., is considering installation of manual training equipment in new three-story high school to cost about $300,000, for which bids will soon be asked on general contract. Smith & May, Calvert Building, Baltimore, are architects.

Graybar Electric Co., 420 Lexington Avenue, New York, electrical equipment and supplies, has leased two-story and basement building, 60 x 70 ft., to be constructed at Charlotte, N. C., for a new factory branch and distributing plant, to cost about $50,000 with equipment. Lockwood Greene Engineers, Inc., Charlotte, N. C., is architect and engineer.

Electric Machinery Mfg. Co., Minneapolis, has moved its Baltimore office from 432 North Calvert Street to 600 North Calvert Street.

New England

BOSTON, March 24. — The Russian Government has placed an order with a Hudson, Mass., manufacturer for 12 universal boring machines, and, although details are lacking, it is understood that it has purchased other shop equipment from New England makers. The Hudson company is 14 weeks behind on deliveries. New England machine tool builders in general are pretty well caught up on backlogs. Local machine tool dealers have received few new inquiries the past week, and bookings also were small. If, however, one half of the tools under negotiation are purchased during the next three months, average six months' sales will look good. Business recovery in general is slow in this territory, and the machine tool trade is still lagging. Used tool buying is rather flat.

Small tool sales have dropped. Manufacturers, who during the last half of 1929 gave extended delivery dates on certain types of tools, now can give spot shipments.

Meade-Morrison Mfg. Co., East Boston, has been awarded contract for coal discharging towers for Portland Terminal Co., Portland, Me. Included are four 5-ton gantry cranes.

City of Westerly, R. I., has awarded general contract for a junior and industrial high school, to contain a machine shop, two wood-working shops, and an automobile repair shop.

United Electric Railway Co., Providence, R. I., has started work on a one-story repair shop addition at Cranston, to cost $4,000 without equipment.

Warren Telechron Co., Ashland, Mass., has started work on a one and two-story addition, 75 x 180 ft.

Public Buildings Department, City Hall Annex, Boston, has filed plans for extensions and improvements in steam power plant at 191 River Street, to cost $230,000. Additional equipment will be installed.

Scott & Williams, Inc., Laconia, N. H., manufacturer of knitting machinery and parts, has awarded general contract to Temple & Crane, Inc., 80 Federal Street, Boston, for a four-story and basement addition, 65 x 250 ft., with wing extension, 25 x 40 ft., to cost over $175,000 with equipment. Lockwood Greene Engineers, Inc., 24 Federal Street, Boston, is architect and engineer.

Rhode Island Ice Co., Woonsocket, R. I., has filed plans for a one-story ice-manufacturing plant, 56 x 150 ft., to cost close to $100,000 with machinery.

Providence Cadillac Co., 9 Federal Street, Providence, R. I., has filed plans for a two and three-story service, repair and sales building, 125 x 215 ft., to cost about $200,000.

Edison Electric Illuminating Co., 39 Boylston Street, Boston, has work under way on a steam power plant at South, Utica and Kneeland Streets, for central steam heating, to cost over $450,000 with equipment. Company will use property acquired along Mystic River at Charlestown and Everett for new steam-operated electric power plant, for which preliminary surveys have been made; it is estimated to cost over $3,500,000 with equipment. Plans have been completed for a new switchboard building at last-noted location, including construction of tunnel under Mystic River for conduit system for transmission lines. Company will make extensions and improvements in power stations on L Street and Scotia Street, for which plans have been drawn by Wadsworth, Hubbard & Smith, 11 Beacon Street, architects.

Goodell-Pratt Co., Greenfield, Mass., manufacturer of micrometers and other precision tools, has acquired control of Goodell Mfg. Co., with local plant for manufacture of small tools, and will operate as a subsidiary.

Philadelphia

PHILADELPHIA, March 24.—Packard, Inc., 3221 North Broad Street, Philadelphia, local representative of Packard automobile, has plans for a four-story service, repair and sales building at Broad Street and Allegheny Avenue, to cost about $300,000 with equipment. Philip S. Tyre, 114 South Fifteenth Street, is architect.

Swift & Co., Union Stock Yards, Chicago, have awarded general contract to Barclay White & Co., 22 North Thirty-sixth Street, Philadelphia, for a new packing plant at Philadelphia, to cost about $100,000 with equipment. A. E. Bump is company architect.

Samuel Miller, Philadelphia, manufacturer of furniture, has leased three-story factory at 719-21 Noble Street for new plant.

Philadelphia Gas Works, 1401 Arch Street, Philadelphia, has filed plans for a new pumping plant on Venango Street, to cost about $30,000 with equipment.

Board of Public Education, Keystone Building, Philadelphia, Edward Merchant, secretary and business manager, is asking bids until April 1 for boilers, motor control equipment, electrical equipment, etc., for various schools.

Gulf Refining Co., Sydenham and Locust Streets, Philadelphia, is planning to rebuild part of storage and distributing plant destroyed by fire March 19, with loss reported over $1,000,000 with equipment. Headquarters are in Frick Annex, Pittsburgh.

Hyatt & Co., Inc., Philadelphia, recently organized by Nathaniel Hyatt, 3209 Pearl Street, and associates with capital of $50,000, contemplates operation of local plant for manufacture of metal roofing, metal heating equipment, etc. George F. Kessler, 5533 Florence Avenue, and Ralph S. Arrison, 1663 Orthodox Street, are interested in new company; Mr. Kessler will be treasurer.

Boyertown Burial Casket Co., Boyertown, Pa., has awarded contract to Ralph McLernan Co., Hearst Building, San Francisco, for three-story factory branch and distributing plant at Oakland, Cal., to cost about $50,000 with equipment.

Wildman Mfg. Co., Norristown, Pa., manufacturer of knitting machines and parts, will soon begin work on a one-story addition, 100 x 200 ft., to cost about $100,000 with equipment.

Universal Installation Service Co., 1700 Walnut Street, Philadelphia, automobile equipment and repairs, has leased two-story building at 1239 North Front Street for expansion.

John A. Roebling's Sons Co., Trenton, N. J., manufacturer of wire rope, cables,

etc., is razing a former wire rope shop to make way for a new one-story unit, 220 x 320 ft., to cost $250,000 with machinery, for which plans have been filed.

Board of Education, Phoenixville, Pa., plans installation of manual training equipment in new junior high school, to cost about $300,000, for which bids have been asked on general contract.

J. J. Beightol, Cameron and Verbeke Streets, Harrisburg, Pa., operating a plant for production of wrought iron products, including ornamental fencing, grills, fire escapes, etc., has purchased local property, 72 x 168 ft., as site for new one-story plant.

Alpha Portland Cement Co., Hamilton Street, Easton, Pa., has approved plans for extensions in power plant at Martins Creek, Pa., to cost about $60,000.

Franklin Pottery Co., Lansdale, Pa., manufacturer of floor and wall tile, has plans for extensions and improvements in machine department, to cost about $45,000 with equipment.

Hahn Engineering Co. has ceased to be a division of Lancaster Iron Works, Inc., Lancaster, Pa., but has become a division of Treadwell Engineering Co., with main offices and works in Easton, Pa. New York office is at 90 West Street. Additional offices are being established.

Pittsburgh

PITTSBURGH, March 24.—Unless business improves markedly the last week of the month, March sales of local machinery dealers will average little better than in January and February and may possibly set a low mark so far this year. New inquiry is also lagging and dealers have made estimates on many tools which have been delayed on more than one occasion. The almost total lack of industrial or railroad lists of any size or importance have given the market a listless tone, as satisfactory sales volume is difficult to achieve with only single tools or small orders to work on.

The railroads are still inactive as buyers, although the Norfolk & Western may come in for a number of tools in the near future. The Pennsylvania is closing against recent inquiries for some of its Eastern shops. Westinghouse Electric & Mfg. Co., East Pittsburgh, is not expected to be a buyer of consequence for several weeks. Railroad car builders, which are better supplied with business than usual, are buying few tools, being inclined to cut expenses by means of replacements and repairs.

Stroh Steel Process Co., Westinghouse Building, Pittsburgh, is planning one-story foundry, 130 x 250 ft., primarily for production of heavy steel castings, to cost over $100,000 with equipment.

Duquesne Light Co., 435 Sixth Avenue, Pittsburgh, has taken out a permit for an addition to steam-operated electric generating plant on Brunot Island, to cost over $1,000,000 with machinery. Byllesby Engineering & Managing Corporation, 231 South La Salle Street, Chicago, is engineer and contractor.

Robert G. Woodside, room 103, 519 Smithfield Street, Pittsburgh, Alleghany County Controller, is asking bids until April 15 for wire rope, steel traffic strips and other materials and equipment.

American Car & Foundry Co., Third Avenue, Huntington, W. Va., has awarded general contract to C. W. Hancock & Sons, Inc., Rand Building, for one-story addition, to cost about $50,000 with equipment. Headquarters are at 30 Church Street, New York.

J. M. Hoagland Co., Sharon-Mercer Road, Sharon, Pa., plans rebuilding part of flour mill and planing mill, recently destroyed by fire.

Firth-Sterling Steel Co., McKeesport, Pa., has plans for two and three-story addition, 50 x 120 ft., to be used as an experimental plant and laboratory, to cost over $70,000 with equipment. United Engineers & Contractors, Inc., Broad and Arch Streets, Philadelphia, is engineer.

Pittsburgh Plate Glass Co., Frick Building, Pittsburgh, will carry out expansion at its plant at Ford City, Pa., including erection of new buildings. It is purposed to remove present plant at Charleroi, Pa., to new location and increase capacity. Entire project will cost over $400,000.

The Crane Market

INQUIRY for overhead cranes continues to accumulate, but buyers are slow to place orders, evidently awaiting evidence of business improvement. The Sinclair Oil Co., New York, has closed on a 10-ton hand power crane for Chicago. The Canadian Benedict Stone Co., Montreal, has closed on a 3-ton, 50-ft. span, four 1-ton, and a 3-ton, overhead cranes with the Northern Engineering Works.

Business in the locomotive crane field has been fair in the Middle West, with the railroads active among purchasers, but the East, especially the New York district, is quiet. Contractors are bidding on some substantial projects and awards have been made in certain cases, but most contractors have sufficient equipment on hand. Johnson's Co., Ltd., Thetford Mines, Quebec, has bought two 15-ton, electrically driven, crawl-tread cranes from the Orton Crane & Shovel Co.

Chicago

CHICAGO, March 24. — Machine tool sales the past week were in moderate volume, but new inquiries have slackened. So far March business, which is usually one of the best months in the year, is only a shade above February, which was rather quiet.

General Electric Co., has bought a 60-in. lathe for its Chicago service shop and is asking for a 24-in., 30-in., 36-in. and an 18-in. lathe, 28-in. shaper, a 4-ft, radial drill, power hack saw, arbor press and a 20-in. drill for its Milwaukee service shop. Chicago & Eastern Illinois will buy several hand electric tools and the Burlington will purchase two power hack saws. Union Pacific and the Elgin, Joliet & Eastern are in the market for a few machine tools.

Marquette Tool & Mfg. Co., 1900 Kilbourne Avenue, Chicago, manufacturer of pneumatic cushions for presses, tools, etc., has leased property at West Sixty-fifth Street and Natchez Avenue, for new one-story plant, totaling about 30,000 sq. ft. floor space, to cost over $70,000 with equipment. Adjoining land has also been secured for later expansion.

Wabash Railway Co., Railway Exchange Building, St. Louis, is considering call for bids early in April for addition to engine house and shops at Decatur, Ill., to cost about $100,000 with equipment. R. E. Mohr, address noted, is company architect.

Pure Oil Co., 35 East Wacker Drive, Chicago, is disposing of a note issue of $20,000,000, part of fund to be used for expansion in oil refineries, storage and distributing plants and new pipe line construction.

City Council, Alexandria, Minn., is planning early call for bids for boiler equipment, stokers and other mechanical apparatus for municipal electric light and power plant. Pillsbury Engineering Co., 2344 Nicollet Avenue, Minneapolis, is engineer.

Fleischmann Co., South Front Street, Pekin, Ill., manufacturer of yeast, has plans for one-story addition for storage and distribution, to cost $50,000 with equipment. L. R. Waterman, Peoria Life Building, Peoria, Ill., is engineer.

Cherokee Machine Co., Cherokee, Iowa, plans rebuilding part of machine shop, recently destroyed by fire.

Colorado Fuel & Iron Co., Pueblo, Colo., is considering a one-story addition at Minnequa plant, for a bolt and spike mill, to cost over $85,000 with equipment.

Ethyl Products Corporation, Johnstown, Colo., J. W. Payne, head, is considering construction of a new refinery for industrial alcohol production, to cost over $75,000 with machinery.

Container Corporation of America, 111 West Washington Street, Chicago, is arranging for an increase in capital from 600,000 to 2,000,000 shares of stock, part of fund to be used for expansion.

Link-Belt Co., 300 West Pershing Road, Chicago, has appointed Idaho Equipment Co., 118 Main St., Boise, Idaho, as its agent handling its complete line of cranes, shovels and draglines.

St. Louis

ST. LOUIS, March 24.—Mid-West Piping & Supply Co., 1450 South Second Street, St. Louis, manufacturer of heating equipment, pipe, etc., has purchased a site at Houston, Tex., fronting on line of Texas & New Orleans Railway, and plans early construction of new branch fabricating plant to cost over $200,000 with equipment.

Board of Education, Board of Education Building, St. Louis, is asking bids until April 2 for initial unit of new vocational school, consisting of main shop building, 188 x 275 ft., and laboratory, 160 x 230 ft., to cost about $1,500,000 with equipment. George W. Sanger is acting commissioner of school buildings.

Springfield Ice & Refrigerating Co., 227 West Mill Street, Springfield, Mo., is planning an addition to cold storage and refrigerating plant, to cost $70,000 with machinery.

City Council, Blackwell, Okla., has plans for a hangar at municipal airport, with repair and reconditioning facilities, to cost about $30,000 with equipment.

Fairfax Airports, Inc., Rosecrans Field, St. Joseph, Mo., operating airports in Kansas and Missouri, is disposing of a stock issue to total $370,000, part of fund to be used for expansion.

Common Council, California, Mo., has called a special election on April 1 to vote bonds for $45,000, proceeds to be used for a municipal electric light and power plant.

R. F. Electrical Mfg. Co., Augusta, Kan., O. C. Jones, manager, has purchased property at Shawnee, Okla., for new one-story plant to manufacture electrical products, initial unit to cost close to $35,000 with equipment.

Moody-Seagraves Co., Fort Worth, Tex., operating oil and natural gas properties, is planning construction of a new pipe line from Stevens County, Kan., to Omaha, Neb., for natural gas service, totaling 300 miles, to cost over $2,000,000 with pressure stations and facilities. Line will be operated by Mission Valley Gas Co., a subsidiary.

St. Louis Airport Commission, St. Louis, has plans for a municipal airport, to cost about $2,000,000 including hangars, repair and reconditioning shops, terminal buildings and other units. B. Russell Shaw Co., 810 Olive Street, is airport engineer, in charge.

Cooperative Equity Exchange, care of Horner & Wyatt, Board of Trade Building, Kansas City, Mo., consulting engineers, has plans for a grain elevator at Cimarron, Kan., with elevating, conveying, screening and other equipment, to cost about $90,000.

Mesker Brothers Iron Co., St. Louis, manufacturer of structural and ornamental steel and iron, has moved its office to 424 South Seventh Street and is erecting a one-story addition, 127 x 200 ft., at Sixth and Poplar Streets, to manufacture wrought iron window frames.

Bartlett Hayward Co., Baltimore, has established a branch office at 4458 Washington Avenue, St. Louis, in charge of A. M. Brown.

Corby Supply Co., 3942 West Pine Boulevard, St. Louis, has been appointed distributer in southern Illinois, Missouri, Kansas, Oklahoma and Arkansas for Reading Chain & Block Corporation, Reading, Pa.

Gulf States

BIRMINGHAM, March 24.—Corsicana Grader & Machine Co., Corsicana, Tex., manufacturer of agricultural machinery and parts, has plans for a one-story addition to cost about $30,000 with equipment.

Gulf States Utilities Co., Beaumont, Tex., operating electric light and power properties, is disposing of a preferred stock issue to total $2,462,500, part of fund to be used for extensions and improvements, including transmission lines.

Magnolia Petroleum Co., Dallas, Tex., a subsidiary of Standard Oil Co. of New York, 26 Broadway, New York, is planning construction of pipe line from Zacaquiesta field to main system of company in Wichita County, about 30 miles, for crude oil service, to cost over $200,000 with booster stations and equipment.

West Texas Utilities Co., Abilene, Tex., contemplates a new ice-manufacturing plant at Dalhart, Tex., to cost about $150,000 with equipment. Company also plans construction of high-tension transmission line from Estelline to Turkey, Tex., and vicinity, about 28 miles, to cost over $100,000.

Board of Education, Lubbock, Tex., plans installation of manual training equipment in new two and three-story high school to cost $650,000, for which general contract has just been let to D. N. Leaverton, Lubbock. Peters, Strange & Bradshaw, Myrick Building, are architects.

C. & C. Battery Mfg. Co., Houston, Tex., plans early production of electric storage batteries and kindred equipment in new plant now being completed.

Lake Griffin Pulp & Paper Corporation, Leesburg, Fla., care of Mary J. Cassidy, Tavares, Fla., recently organized, is considering new pulp and paper mill near Leesburg, using saw grass as source of raw material, with power plant and machine shop, to cost about $1,000,000 including machinery.

Ira J. Bell, Pecos, Tex., president, Silver Domes Mines Co., Marfa, Tex., is at head of project to construct and operate a hydroelectric generating plant on Rio Grande River, about 42 miles below Marfa in Presidio County, for power supply for mining properties. A transmission line will be built to mines; entire project to cost over $250,000.

San Benito Independent School District, San Benito, Tex., has authorized installation of a vocational training department in new junior-senior high school, to cost over $225,000 with equipment. Phelps & Dewees, Gunter Building, San Antonio, Tex., are architects.

City Council, Fort Worth, Tex., has plans for a hangar, 80 x 160 ft., at municipal airport, including repair and reconditioning facilities, to cost about $40,000 with equipment. D. L. Lewis is city engineer; C. M. Thelin, Fort Worth, is designing engineer.

Crane Co., 836 South Michigan Avenue, Chicago, has awarded general contract to Beckelheimer & Small, Hattiesburg, Miss., for a one-story factory branch and distributing plant at Jackson, Miss., to cost about $50,000 with equipment. N. W. Overstreet, Mississippi Fire Insurance Building, Jackson, is architect.

Fire-O-Larm Co., Fort Worth, Tex., care of Garland Tunstill, W. T. Waggoner Building, recently organized by Mr. Tunstill and associates, is planning operation of plant to manufacture a patented fire alarm and kindred specialties. Mr. Tunstill will be president of company.

Board of Education, Bogalusa, La., has asked bids on general contract for a new unit at high school, to be known as W. H. Sullivan Memorial Manual Training School, to cost over $80,000 with equipment. Rathbone DeBuys, Hibernia Bank Building, New Orleans, is architect.

Cincinnati

CINCINNATI, March 24. — With a marked increase in sales of lathes and cutter grinders the past week, the machine tool trade in this district experienced one of the best weeks this year. Demand for tools in this territory appears to be on the uptrend. Inquiries continue in fair volume, but are mostly for one or two machines at a time. Average production schedules, however, are below normal and are governed by current bookings.

The Amtorg Trading Corporation, New York, placed its first duplicate order with a local manufacturer for 13 lathes, following receipt of quotations on its recent inquiry for about 30 machines. The remainder of this business is still pending.

Dreses Machine Tool Co., 2429 Spring Grove Avenue, Cincinnati, has asked bids on general contract for a one and two-story and basement plant, 150 x 220 ft., to cost over $125,000 with equipment.

Austin & Virtue, 17 South High Street, Columbus, Ohio, architects, will soon take bids for an eight-story automobile service, repair and garage building, to cost $180,000 with equipment.

Board of Public Affairs, Versailles, Ohio, is planning extensions and improvements in municipal electric light and power plant, including installation of additional equipment.

Delco Light Co., Dayton, Ohio, a subsidiary of General Motors Corporation, Detroit, manufacturer of isolated electric lighting plants, etc., is developing new equipment for isolated gas-generating plants for rural service, and plans establishment of new department for manufacture.

Meem-Haskins Coal Co., Whitesburg, Ky., is planning to rebuild tipple, conveyor, head house and other structures at local mining plant, recently destroyed by fire.

Southern Cotton Oil Co., Memphis, Tenn., has awarded general contract to S. & W. Construction Co., Shrine Building, for additions to plant on Bellevue Boulevard, including four-story refining unit, 90 x 100 ft.; one-story acid plant, 40 x 100 ft.; two-story laboratory, 25 x 55 ft., with oil tanks and other storage and distributing facilities, to cost $275,000 including equipment.

Board of Education, Memphis, Tenn., is planning installation of manual training equipment in new Southeast junior high school, to cost $325,000, for which bids are being asked on general contract until April 3. E. L. Harrison, Fidelity Building, is architect.

Milwaukee

MILWAUKEE, March 24.—While no marked improvement in the demand for machine tools is noted, sentiment among manufacturers and dealers is more cheerful in view of the prospects for more active business as spring advances. March volume in most plants will exceed that of any month in the December-February period, although somewhat under the corresponding month of 1929, while April is expected to show another gain.

Trackson Co., division of George H. Smith Steel Casting Co., 500 Clinton Street, Milwaukee, manufacturing crawler attachments and general tractor equipment, will begin work April 1 on first unit, 150 x 200 ft., of new machine shop group on 20-acre site at Holt Avenue and Chase Street. Initial investment is estimated at $125,000, including additional machinery. Walter H. Stiemke is vice-president and general manager.

Universal Atlas Portland Cement Co., Chicago, has plans for a new distributing plant in Milwaukee on water front site, to consist of 10 75,000-bbl. bulk storage tanks and building for sacking, elevator equipment and office. Estimated cost is $500,000. Boyd Clark is Milwaukee representative.

Automotive Foundries, Inc., La Crosse, Wis., is awarding contract for a machine shop extension costing about $30,000.

Munising Paper Co., Munising, Mich., has contracted with C. R. Meyer & Sons Construction Co., 50 State Street, Oshkosh, Wis., for new steam power plant costing about $50,000.

Milwaukee Electric Railway & Light Co., 217 Michigan Street, Milwaukee, closed bids March 22 for construction of addition to switchhouse, 67 x 90 ft., at Lakeside steam generating plant. Cost of unit is estimated at $200,000. George G. Post is chief electrical engineer.

Snow-Flyer Co., New Holstein, Wis., manufacturing crawler and runner attachments for automobiles, trucks and tractors, will start work April 1 on addition to machine shop, assembly room and shipping department. Investment will be about $50,000.

Buffalo

BUFFALO, March 24. — Queen City Milling Co., Ellicott Square, Buffalo, has asked bids on general contract for four-story flour mill, to cost about $100,000 with equipment. G. Morton Wolfe, 1277 Main Street, is architect and engineer.

Scobell-Chapin, Inc., Rochester, N. Y., care of Ralph D. Scobell, 71 Hurstbourne Street, recently organized by Mr. Scobell and associates, plans operation of local factory for manufacture of fire extinguishers and equipment. Edmund L. Chapin, 2630 East Avenue, is interested in new company.

Oneidacraft, Inc., Oneida, N. Y., manufacturer of furniture, has awarded general contract to Dall, Hayden, Treat, Inc., Grand Central Terminal, New York, for four-story addition, to cost about $175,000 with equipment.

Niagara Hudson Power Corporation, Buffalo, will carry out an expansion program at coke and by-products plant at Troy, N. Y., to cost over $1,000,000 with equipment. New coke ovens and other equipment will be installed, 300-ft. stack built, with new system for cooling gases.

Buffalo Steel Co., Buffalo, with plant at Tonawanda, has arranged for increase in capital from $600,000 to 30,000 shares of stock, no par value, for general expansion.

Indiana

INDIANAPOLIS, March 24. — Zimmer Paper Products Co., Indianapolis, manufacturer of waxed and processed papers, which recently established plant at Nineteenth Street and Martindale Avenue, is considering establishment of new manufacturing unit to double present capacity.

Big Four Railroad Co., Big Four Building, Indianapolis, has plans for a one-story unit at car repair shops at Beech Grove, Ind., to replace structure recently destroyed by fire, to cost over $250,000 with equipment. E. J. Bayer is division engineer, address noted.

Bendix Aviation Corporation, South Bend, manufacturer of automobile and aircraft equipment, is concluding arrangements for acquisition of Hydraulic Brake Associates, Ltd., operating Hydraulic Brake Co., 2843 East Grand Boulevard, Detroit. Acquired company will be continued as a unit of Bendix company and expansion carried out.

Mid-West Corporation, Indianapolis, care of Bishop, Knowlton & Carson, 312 North Meridian, architects, has plans for a one-story machine shop and mechanical plant, to cost over $50,000 with equipment.

City Council, City Hall, Indianapolis, has voted to discontinue operations at city hall power station, used for central heating service, and will purchase requirements from Indianapolis Power & Light Co., 48 Monument Circle, which will extend facilities in city hall district for service, totaling close to 4,500,000 lb. of steam per annum.

Milroy Milling Co., Milroy, is planning new grain elevator and mill to cost over $100,000, with elevating, conveying, screening and other equipment, to replace unit destroyed by fire several months ago.

Zier Boiler & Sheet Iron Works, New Albany, has sufficient contracts from Government and private companies to provide as much business this year as in 1929. Company plans to double its working force within a month. In addition to a steel derrick boat, 36 x 95 ft., for Government, company has orders for nine ocean buoys and considerable boat construction work for private interests.

Connersville Blower Co., Inc., Connersville, has awarded contract for an addition, 25 x 125 ft., to its Victor department to provide for a rearrangement of equipment for production of Victor rotary positive blowers and gas pumps, also Connersville meters of smaller capacities.

Standard Steel Specialty Co., Beaver Falls, Pa., has purchased seven acres at Hammond, Ind., as a site for a Western branch for production of steel elevator equipment. Main building will be 100 x 200 ft.

Detroit

DETROIT, March 24. — Letts Drop Forge Co., West Jefferson Avenue, Detroit, has awarded a general contract to Truscon Steel Co., 615 Wayne Street, for a one-story hammer shop, to cost about $30,000 including equipment.

Firestone Tire & Rubber Co., Akron, Ohio, is planning factory branch and distributing plant at Detroit, to cost over $80,000 with equipment.

Briggs Mfg. Co., Highland Park, Detroit, manufacturer of automobile bodies, will develop a new department for production of metal stampings for automotive service. Work will be in charge of S. J. Menzel, formerly connected with Mullins Mfg. Corporation, Salem, Ohio, manufacturer of kindred products.

Issoudin Aircraft Corporation, Northville, which recently took over former local plant of Stinson Aircraft Corporation, will concentrate production on amphibian type airplanes, including parts and assembling departments. Major Thomas G. Lanphier is president.

Detroit Street Railways, Detroit, has begun erection of new car house at Dearborn, with inspection and repair facilities, to cost about $300,000 with equipment. General contract recently was let to Gallagher-Flemming Co., 6500 Epworth Street.

Nolet Packing Co., Morton Street, Bay City, meat packer, is contemplating a one-story addition to cost about $30,000 with equipment.

Detroit Power Shovel Co., 8751 West Grand River Avenue, Detroit, recently formed with capital of $100,000 to manufacture power shovels, hydraulic clutches, etc., is planning early operation of local plant. Walter E. and Fred Bernhard head company.

Board of Education, Hastings, is planning installation of manual training equipment in new two-story junior high school to cost about $200,000, for which plans are being drawn by W. S. Holmes Co., Capitol Savings and Loan Building, Lansing, architects.

Ann Arbor Railroad Co., Ann Arbor, has awarded general contract to Walsh Construction Co., 19 South La Salle Street, Chicago, for one-story shop unit at car repair works at Owosso, to cost over $50,000 with equipment, to replace a structure destroyed by fire a few months ago.

Sparks-Withington Co., Jackson, manufacturer of automobile equipment, radio apparatus, etc., has arranged for increase in capital stock, part of proceeds to be used for expansion.

Cleveland

CLEVELAND, March 24.—Demand for machine tools fell off the past week during which there was a decrease both in orders and inquiries. March will not make as good a showing as February with some manufacturers. A good volume of inquiry is still pending, but many prospective buyers are deferring purchases until business improves. Virtually no business is coming from the motor car manufacturers or parts makers.

Kroehler Mfg. Co., 1644 Doan Avenue, Cleveland, manufacturer of furniture, has awarded general contract to Austin Co., for three-story and basement plant, 80 x 200 ft., to cost about $175,000 with equipment. Headquarters are in Fisher Building, Chicago. J. O. Taylor is company architect and engineer.

Truscon Steel Co., Youngstown, Ohio, plans rebuilding part of plant at San Francisco, recently destroyed by fire.

Valve Bag Co. of America, Inc., Toledo, Ohio, manufacturer of heavy paper bags for cement, lime, plaster, etc., is planning expansion and installation of additional equipment, to cost about $100,000.

Allen Brett, 1101 Ulmer Building, Cleveland, engineer, has asked bids on general contract for a five-story automobile service, repair and garage building, to cost about $135,000 with equipment.

Artificial Wood Works Co., Cleveland, recently organized with capital of $100,000 to take over and expand Art Wood Works Co., 10618 Cedar Avenue, manufacturer of artificial wood products for automobile steering wheels, gun butts, etc., is planning to double present capacity; an addition will be built.

Osborn Mfg. Co., 5401 Hamilton Avenue, Cleveland, manufacturer of foundry brushes and equipment, has awarded general contract to Austin Co., for one-story addition to machine shop, to cost $45,000 with equipment.

Pacific Coast

SAN FRANCISCO, March 20.—Holly Sugar Co., Tracy, Cal., is planning extensions and improvements at local beet sugar mill, to cost about $100,000 including additional equipment. Headquarters are at Colorado Springs, Colo. G. J. Daley is general superintendent at Tracy mill.

Rotary Process Refining Co., Subway Terminal Building, Los Angeles, has plans for a new oil refinery at Vinvale Station, Downey, Cal., to cost about $65,000 with equipment.

Atlas Imperial Engine Co., Peterson Street, Oakland, Cal., manufacturer of Diesel gas engines and parts, has arranged for an increase in capital from 300,000 to 350,000 shares, part of fund to be used for expansion.

Shields, Fisher & Lake, Pacific Southwest Building, Fresno, Cal., architects, have plans for a two-story automobile service, repair and garage building, to cost about $100,000 with equipment.

Folsom Street Iron Works, Seventeenth and Missouri Streets, San Francisco, has awarded a general contract to Mission Concrete Co., 270 Turk Street, for a one-story addition, to cost about $30,000 with equipment.

Pacific Foundry Co., Eighteenth and Harrison Streets, San Francisco, is considering extensions and improvements in

plant, including installation of additional equipment.

Gypsum Products Co., 6851 East Marginal Way, Seattle, has awarded a general contract to Wallace Bridge & Structural Steel Co., West Marginal Way, to cost about $150,000 with equipment.

Great Northern Railway Co., St. Paul, Minn., is planning an addition to engine house at Hillyard, Wash., with shop facilities, to cost about $80,000. Company will also build a gravel washing plant near Olds, Wash., to cost $50,000 with equipment.

Union Oil Co. of California, Union Oil Building, Los Angeles, operating refineries, storage and distributing plants, is disposing of a bond issue of $15,000,000, part of fund to be used for expansion and improvements. L. P. St. Clair is executive vice-president.

Canada

TORONTO, March 24.—Peterborough Tool Works, Peterborough, Ont., proposes to start work immediately on a new tool and die making plant.

City of Edmundston, N. B., has awarded contract to Powers & Casey, Royal Hotel, for erection of a municipal power house and dam, to cost $152,000. H. G. Acres & Co., Niagara Falls, Ont., are consulting engineers.

Canadian Marconi Co., Ltd., 211 St. Sacrement Street, Montreal, has awarded contract for erection of an addition, to cost $175,000.

Kroehler Mfg. Co., Stratford, Ont., has awarded contract for erection of a factory and addition to power house at Montreal, to cost $50,000.

Plans are being prepared by M. Pratt, architect, for a paper mill at Hull, Que., for E. B. Eddy Co., Ltd., Bridge Street, to cost between $2,000,000 and $3,000,000. V. Drury, 360 St. James Street, Montreal, is president.

Consolidated Aircraft Co., Bridgeburg, Ont., has awarded contract to Austin Co., Cleveland, for a manufacturing plant, boiler house and hangar to cost $60,000.

Bids are being received until April 7 by James Agnew, clerk, Lucknow, Ont., for improvement to waterworks plant, to cost $65,000.

Municipal Council, Plessisville, Que., contemplates installing new electric pumping units and gasoline fire pump in waterworks plant. C. C. Lessard, 32 Des Allies Boulevard, Quebec, is engineer.

Western Canada

Winnipeg Brass, Ltd., Winnipeg, Man., has completed erection of a new plant, two stories and basement, 50 x 200 ft., in which equipment has been installed to manufacture brass, bronze and aluminum products, and also equipment for chromium plating. Winnipeg Brass Company was recently taken over by Canadian Bronze, Ltd., Montreal, and is operated as a subsidiary.

MacDonald Brothers Aircraft, Ltd., Winnipeg, formerly MacDonald Brothers Sheet & Metal Roofing Co., has been incorporated with Grant MacDonald, president and manager; J. D. MacDonald, vice-president, and Edwin MacDonald, secretary-treasurer. Company has been devoting part of its operations to erection of airplane hangars in western Canada; it proposes to build an addition, to cost $30,000, to manufacture parts for airplane service stations.

Grosser & Glass, Ltd., Kerrobert, Sask., has purchased a site at Prince Albert, Sask., and will erect a machine shop, 50 x 100 ft.

Canadian Warren Pink, Ltd., St. Catharines, Ont., has purchased property on Fourth Avenue West, Vancouver, B. C., for erection of a plant to manufacture axes, peavies ani other drop-forged tools for logging and lumber trade.

Foreign

PLANS are under way by United Chemical & Metallurgical Works (Aussiger Verein), Prague, Czechoslovakia, for expansion and improvements to cost about $3,000,000, including addition to plant at Falknov (Falkenau) for production of nitrogen, to cost close to $1,000,000.

Anderson, Clayton & Co., Cotton Exchange Building, Houston, Tex., have purchased cottonseed oil mill at Mexicala, Lower California, Mexico, heretofore operated by Juan S. Brittingham, including a branch oil refinery at Mexico City, and will operate as foreign properties. A new company will be organized to take over and expand properties to be headed by A. H. Lamberth, heretofore Western manager of Anderson, Clayton & Co., at Los Angeles. Dudley C. Johnson, manager of San Marcos Oil Mill, San Marcos, Tex., will be manager of properties, with headquarters at Mexicala.

Lautaro Nitrate Co., Ltd., operated by Anglo-Chilean Consolidated Nitrate Corporation, 120 Broadway, New York, has work under way on new plant for production of nitrate of soda and kindred products in Chile, to cost over $2,500,000 with machinery, and scheduled for operation about middle of 1931.

City Government, Sydney, New South Wales, Australia, has arranged for about $10,000,000 bond sale in United States, proceeds to be used for extension of municipal electric light and power plants and system, furnishing service to Sydney and 43 other communities within radius of 771 square miles. Electricity Commission is in charge.

Societa Generale Elecrtrica della Sicilia, Rome, Italy, is planning for electrification of its sulphur mining properties, work to be carried out during next 12 to 18 months.

Curtiss-Wright Export Corporation, 27 West Fifty-seventh Street, New York, operated by Curtiss-Wright Aircraft Co., same address, with main plants at Buffalo, N. Y., and Paterson, N. J., has plans for a new plant at Los Cerrillos airport, Santiago, Chile, in accordance with agreement with Chilean Government. Initial plant will consist of three one-story units, comprising manufacturing division for parts production and assembling; hangar, with repair and reconditioning facilities, and office and service building. It will manufacture both military and commercial aircraft.

Holnens Papper Bruk, Norrkoeping, Sweden, is planning to rebuild paper and pulp mills recently destroyed by fire, with loss reported at close to 3,000,000 kroner (about $810,000) including machinery.

New Trade Publications

Gas and Oil Burners.—Lee B. Mettler Co., 406 South Main Street, Los Angeles. Bulletin of 25 pages illustrating Mettler burner installations in numerous boilers, heaters and furnaces of many different makes.

Steam Drop Hammers. — Erie Foundry Co., Erie, Pa. Bulletin 230 of 23 pages, illustrating and describing various sizes of type-G steam drop hammer, ranging in rated size from 400 lb. to 30,000 lb., which incorporates extended frame construction, piston-type motion valve and bushing, and a new guide design.

Molding Machines.—Milwaukee Foundry Equipment Co., Milwaukee. Catalog of 24 pages, illustrating and describing a large line of molding machines, specifications for which are included. Plain and jolt squeezers, jolt squeezing strippers, jolt and hand rollovers with foot draw, power jolt rollover draws and jolt strippers are featured.

Steel Castings.—Lebanon Steel Foundry, Lebanon, Pa. The four-page illustrated leaflet, entitled "How Lebanon Stops a Hidden Leak that Wears Away Your Profits," discusses high-pressure valves made of steel castings by the Lebanon company.

Steel Castings.—Sivyer Steel Casting Co., Milwaukee. A four-page leaflet, illustrated, describes certain alloy steel castings used as chuck bodies for "tremendous grip strains."

Testing Machines.—Herman A. Holz, 167 East Thirty-third Street, New York. Brochure briefly comparing the accuracy, rapidity, and ruggedness of testing machines using the Amsler hydraulic principle with lever type machines.

Conveyor Furnaces. — Hevi Duty Electric Co., Milwaukee. Bulletin 230 of four pages covers electric conveyor furnaces of the floating belt type. It describes this method of conveying parts to be heat treated through the furnace on a floating belt made of nickel-chromium wire.

Rustless Steel Castings. — Duraloy Co., Pittsburgh. An eight-page illustrated leaflet describes special alloys, principally castings, of chromium and chromium-nickel steels for resistance to oxidation, corrosion and abrasion. There are two tables which give data as to composition and special properties of various types of Duraloy products.

Welding of Aluminum. — Aluminum Co. of America, Pittsburgh. Devoted chiefly to oxy-acetylene method for sheets, thin plates and castings, although some notes on spot welding of sheet, strip and extruded shapes.

Electric Furnaces and Hot Plates.—Hevi Duty Electric Co., Milwaukee. Catalog 30 contains 32 pages of detailed descriptions and specifications of line of laboratory furnaces and hot plates.

Overload Switch. — Cutler-Hammer, Inc., Milwaukee. Bulletin 9101 of two pages illustrates and describes new overload switch for small motors for refrigerators, washing machines, shoe repair machines, small paint sprayers, ice cream freezers, etc.

Roller Bearings.—American Roller Bearing Co., Pittsburgh. Catalog of

The Week's News Quickly Told

Current Events That Bear on the Course of Business

TRADE, except in the South, shows little change, although sentiment is hopeful. As the National Business Survey reports, "Some early retarding factors, partly psychological, appear to have been gradually overcome."

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CONSTRUCTION is a very important influence on restoring industrial balance, according to the same authority. Unfortunately this has not responded to the stimulation of cheap money, and February contracts reached a new low . . . Residential construction, which normally about equals in value that of all other classes, is now only about half as much. Many foreclosures and tax sales have restricted offerings of money for second mortgages.

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WHEAT prices have increased about 10c. per bushel, reflecting the liberal purchases of Canadian wheat by Europeans. Other grains are strong, forecasting a probable upturn in commodity price index, which had declined steadily for several weeks to the lowest figure in a decade.

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COTTON and wool textiles and carpet manufacturing are all operating at a rate approximately 15 per cent lower than a year ago . . . New Bedford plants are operating 55 per cent of the spindles and looms . . . Prices for finished goods are very low. Workmen at Amoskeag mills voted against a 10-per cent wage cut, which would have enabled the company to close a contract requiring capacity operation for six months . . . An upturn in cotton prices is expected to stimulate wholesale purchasing of cloth . . . Planters in the Memphis region will cultivate a considerably smaller acreage this Summer.

UNEMPLOYMENT and bread lines figure in the news from the larger cities . . . While labor conditions in New York seem to be discouraging, employment throughout the country holds it own, and pay rolls in February increased three per cent over January, according to the U. S. Bureau of Labor Statistics. Striking improvement occurred in the automotive industry (25 per cent), while iron and steel production and fabrication averaged an increase in pay rolls of 8½ per cent . . . In Cuba a one-day general strike to protest against unemployment completely stopped organized activities.

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AUTOMOBILE production during 1930 will total about 4,600,000 units, according to reports to the National Business Survey . . . General Motors delivered nearly 90,000 cars to users in February, which President Sloan says is near the normal rate . . . Current manufacture is at about the rate achieved by the industry in 1928 . . . American Petroleum Institute estimates that 22 per cent more gasoline will be used in 1930 than in 1929.

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MONEY is very cheap and plentiful. Bankers' acceptances have been reduced ten times since March 1, and are now at about 2½ per cent . . . Call rates on New York Stock Exchange touched 1½ per cent, the lowest in 13 years. This has stimulated sharply the dealings in stocks and bonds . . . Brokers loans have increased $350,000,000 in three weeks . . . Fifty representative stocks gained 6.3 points last week, bringing the net recovery to date of 65 of the 147 points lost during the November decline . . . Chase National Bank acquires two New York trust companies and becomes the world's largest bank, exceeding in resources National City Bank of New York and Midlands Bank of London.

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INCOME taxes are reported to be considerably lower in most districts where the individual returns predominate, but this is expected to be counterbalanced by increased taxes on corporate earnings . . . Nearly all governmental departments have increased expenditures in the eight months of the current fiscal year. The aggregate sum is 10 per cent over the previous similar period.

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PULLMAN passenger-miles have remained nearly constant for five years, but an increasing number of cars are being operated, to the detriment of the loading factor. Earnings in 1929 were $20,750,000, nearly 10 per cent lower than in 1928 . . . Fast service between New York and Boston is inaugurated by the New Haven railroad, making the 230-mile trip at 50 miles per hour.

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UNREST in Haiti, demanding presence of American marines, has been caused by protracted rule of President Borno, finds President Hoover's commission. Borno is retiring in favor of Eugene Roy, a business man, who was unanimously chosen by the electoral college to serve until a popular election can be held . . . A $20,000,000 dam across the Blue Nile in Abyssinia will be financed and built by J. G. White Co. of New York. It will be used for an irrigation project in Egypt and the water rents have been guaranteed by the British government . . . Curtiss-Wright will build a branch factory at Santiago, Chile, with capacity of 50 planes a year.

76 pages giving illustrations and specifications of various sizes of roller bearings — medium-duty, heavy-duty and super-heavy-duty. Drawings show various methods of installation in regard to end plate construction, doweling of inner races and control of thrust. Many illustrations feature industrial applications of bearings.

Properties of Haynes Stellite.—Haynes Stellite Co., Kokomo, Ind. Loose-leaf binder containing 30 data sheets, 8½ x 11 in., describing the property of red hardness, the manufacture of cutting tools, the microstructure, corrosion-resistance and other physical properties of stellite.

Remote Type Instruments.—Brown Instrument Co., Philadelphia. Catalog No. 7501 describes instruments for indicating and recording pressures, liquid levels, flows or positions at any distance from the spot. The transmitting and receiving instruments operate as a rugged self-balancing induction bridge, and the reaction equals the action despite normal fluctuations in voltage of the operating current.

Screw Machine Products of Aluminum.—Aluminum Co. of America, Pittsburgh. Beautifully illustrated pamphlet, 52 pages, describing adaptability of alloys 17S, 25S and 51S in various tempers for machined parts used in many industries. Also dimensioned sketches showing stock sizes of screws, bolts and nuts.

Bending Machines.—Wallace Supplies Mfg. Co., 1310 Diversey Parkway, Chicago. Catalog No. 26, 32 pages, devoted to both hand and power machines.

Tungsten-Carbide Cutting Tools.—Firth-Sterling Steel Co., McKeesport, Pa. Booklet of 14 pages, 4 x 9 in., describing Firthite Mechanigript tools and Firthaloy wire drawing dies. Methods of keying Firthite blanks in the tool shanks are illustrated and data given on tool angles and grinding.

Pneumatic Drills.—Chicago Pneumatic Tool Co., New York. Bulletin 850, 8½ x 11 in., 22 pages, describes the CP line of one-man rotating drills, tanks and fittings for wet drilling and tripods and cradle mounting supports. Specifications are given as well as the drill steel recommendations for each machine.

Oil-Testing Apparatus.—American Instrument Co., Inc., 774 Girard Street, N. W., Washington. Four-page bulletin, No. 11, describing one and two-tube Aminco Saybolt type viscosimeters for use in laboratory or where only a small amount of testing is done. Prices are given.

Grinding Machinery.—Samuel C. Rogers & Co., 191 Dutton Avenue, Buffalo. Four sheets for insertion in Rogers' looseleaf catalog, giving prices effective March 1 on various machines for grinding knives, sharpening and gumming circular saws and filing and setting band saws.

Heating and Ventilating Systems.—Lee Air Heater Co., Youngstown, Ohio. Booklet of 18 pages covering construction and operation of Lee direct hot air boilers and distributing systems. Photographs show typical installations. Fuel cost figures compared with steam systems are given.

Oil Storage Tank Roofs.—Chicago Bridge & Iron Works, 37 West Van Buren Street, Chicago. Booklet of 24 pages, bearing title of: "Stopping Evaporation with the Wiggins' Breather Roof." Structural details of the Wiggins' roof, tables of evaporation losses, and illustrations of typical installations are given.

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